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A GEOGRAPHIC STUDY OF DULUTH

BY

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Introduction. The City of Duluth holds a rather unique position among the cities of the country because of its youth, its rapid growth, and its association with one of the world's most important resources. Its location, topographically, geologically and climatically, as well as geographically, brings about a combination of conditions which arouses the interest of nearly all its visitors. These conditions are worthy of special consideration because they are so clearly bound up with the geography of not only the locality itself but a vast territory immediately adjacent. The city has had an exceptional, though conservative growth. On the one hand, it shows distinctly the characteristics of a small city; on the other hand, it displays the spirit of a metropolis, and in many respects exhibits the characteristics as well.

To the student of geography it presents not only a most fascinating study but offers an opportunity for a practical geographic study. With the idea of combining both the theoretical and the practical, this paper has been prepared. Not only has the unsatisfactory "boom" literature been thoroughly studied, but individuals have been interviewed who have witnessed the city grow, who have played an important rôle in its growth, and who even to-day have a hand in shaping its destiny.

Location. Duluth is located in latitude $46^{\circ} 48'$ north and longitude $92^{\circ} 6'$ west. It lies on the western shore of the southwestern end of Lake Superior. At this place the tapering extension of the

world's largest inland lake ends in a bay which, with its protecting spits and bars, forms one of the world's most efficient harbors (Figs. 1-3).

The city lies in the northeastern part of Minnesota, at the mouth of the St. Louis River, and at the head of navigation on Lake Superior. It is essentially in the center of the North American continent and in the extreme north central part of the United States. Therefore, so far as mere geographic distance is concerned, Duluth is close to all important points in North America and easily accessible from all directions—a decided advantage.

Topography. Although situated on a lake shore, it is not upon a flat. In fact, the larger part of the city is located on the south-

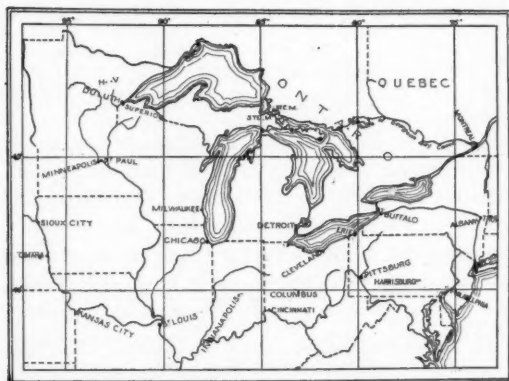


FIG. 1—Outline map to show location of Duluth with reference to the Great Lakes and Vicinity.

eastern slope of a rather steep range of hills which parallels the lake shore (Fig. 2). The range is steepest at a point opposite the industrial center of the city, that is, opposite Rices Point. Immediately to the southwest and to the northeast

the gradient of the slope becomes less steep. A few creeks dissect the hillside, increasing the steepness of the gradients in places, thereby adding considerably to the scenic beauty. Practically the only flat land is that on Minnesota Point, Rices Point, and a narrow strip bordering the western bank of the St. Louis River. This distribution of hill and flat has constituted an advantage at times, and again a distinct handicap.

The shape of the city is elongate; its maximum length, 20 miles, is about four times its maximum width, 5 miles (Fig. 3).

Geology. The geology of the Duluth region is very complex. In this discussion only the larger factors are noted (Fig. 2). The basic rocks are among the oldest known on the earth's surface, belonging to the Keweenaw formations of the Proterozoic era.*

* Chamberlin and Salisbury Geology, Vol. II, pages 148-149, 1904.

The rocks are primarily lavas, gabbros, diabases, basalts, and other igneous formations, most of which possess a schistose structure. Economically, these rocks are a hindrance, as their extreme hardness and lack of natural lines of fracture make excavations in them most difficult, and therefore expensive.

All of the area was glaciated by the great continental ice sheet which came from Canada and moved over approximately the northern half of the United States (Fig. 4). Glaciation has had an important influence upon the locality. While the hills were worn down considerably, yet deposits of a heavy red boulder-clay, or till, were laid down in isolated areas within the city limits and over rather extensive areas just outside of the city.

The water from the melting of the ice sheet did **not at first** recede

to the present level of Lake Superior, but remained at a height of about 534 feet above the present level. At this height a beach was formed,* remnants of which can still be traced. At an elevation of

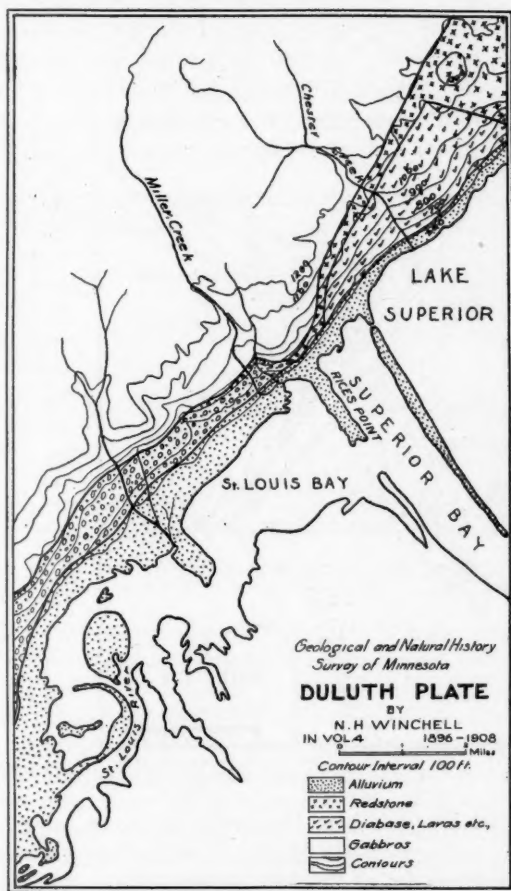


FIG. 2.

*N. H. Winchell, Geological and Natural History Survey of Minnesota, Vol. IV, 1896-1898.

about 475 feet (Fig. 5) another beach is located, indicating the fact that the lake must have remained at this level for a long period. The citizens utilize this beach as a driveway, calling it the Boulevard Drive. It extends essentially the entire length of the city. The view from it over the city and lake is a great source of pleasure to the citizens, as well as visitors to the city, who invariably are taken upon a tour of this road. A series of lesser beaches are discernible in part down to the present level of the lake. In some instances these beaches have determined the courses of the streets of the city.

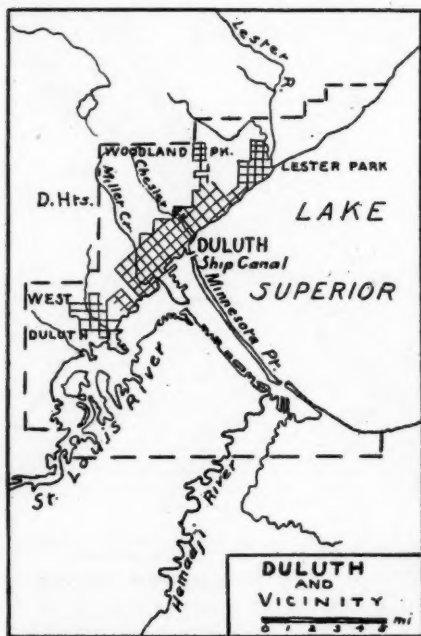


FIG. 3—Copied after Dodge's Geography, Rand McNally & Co., Chicago, slightly modified.

It is worth while here to mention the geology of the region just back of Duluth, for this hinterland, covering a radius of 100 miles, is in large part responsible for the city's growth. The rock-mass is somewhat similar to that at Duluth, but is considerably older. In the vicinity of Hibbing, Virginia and Tower the deposits consist of Huronian and Laurentian granites primarily, with greenstones, slates and conglomerates. It is in the former igneous rocks that the world's richest known deposits of iron ore occur.*

On the glacial till deposited in this area has grown an extensive

forest that has given rise to the vast but now waning lumber industry of Northern Minnesota. Now that the forests are being removed, the possibility of the soils for agricultural production looms up as a remaining resource.

CLIMATIC CHARACTERISTICS

Temperature. Duluth is in the Intermediate or Temperate Zone. It is just about in the center of this zone, within the path of high-

* Van Hise and Leith, U. S. G. S. Bulletin 360, "Pre-Cambrian Geology of U. S.," Map (p. 330).

est frequency of the continental high pressure (Highs) and low pressure (Lows)* storm areas. The temperature to be expected would therefore show a considerable range, both daily and annual. Fig. 6 indicates the variation in the average temperature for the twelve months of the year. January is the coldest and July the warmest month. Spring is cooler than autumn, as shown by the relative lengths of the curves connecting the temperature of the winter months with that of the summer months and the temperature of the summer months with that of the winter months.

While averages are useful for some purposes, they do not always describe a situation as truly as extremes which make up those averages. Therefore, it has been deemed worth while to show the variations in the absolute extremes of temperature for the months of the years 1901-1910 inclusive* (Fig. 7). These diagrams define clearly the fact that the temperature always falls to slightly below -20° F. at least once during the winter. This low

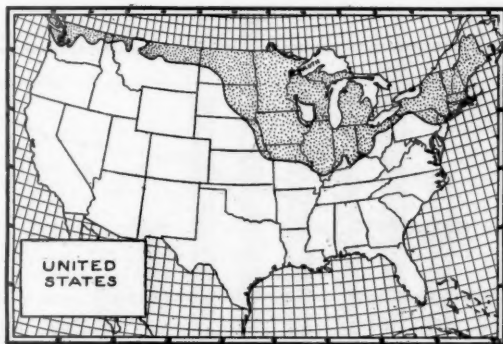


FIG. 4—Duluth and the Glacial Soils in the U. S. Sketched after map, p. 331, Vol. III, Chamberlin and Salisbury's Geology.

temperature may be expected in January or February. On the other hand, the highest temperature may reach 98° F. at least once during the summer months, usually in July. It should be noted that the low temperatures occur nearly always in the early hours of the morning, and that as soon as the sun rises well above the horizon the temperatures rise rapidly; hence, the citizens are rarely exposed to the lowest temperatures (Fig. 8). This is a very significant fact, because the climatic reputation which any locality may have should not be established on a basis of absolute extremes of temperature as recorded during the hours of the night, but rather upon the temperatures which any individual must endure during the working hours of the day. On this basis alone, even neglecting other climatic factors,

* The highest temperature recorded during the past forty years is 99° F., as observed on July 1, 1883. The lowest recorded temperature for the same period is -41° F., recorded January 2, 1885.

the range of temperature in Duluth is not severe. It may be described as a range sufficient to instil briskness and vigor in the individual and to stimulate him to activities which make for progress.

The temperature extremes at Duluth are not as wide as they are at distances of 50 or 100 miles westward, because of the presence of Lake Superior. During the summer time the waters of the lake are quite cold. Winds blowing over the lake upon the land, therefore, are cooling winds. During the winter months the winds are prevailing from land to the water; the humid air over the lake is blown away from the land, leaving the air over the land with low humidity; hence, the low temperatures cause no suffering. Although the relative humidity is rather high during the summer, the temperature is relatively low; hence, the sensible temperature is not oppressive, but quite comfortable.

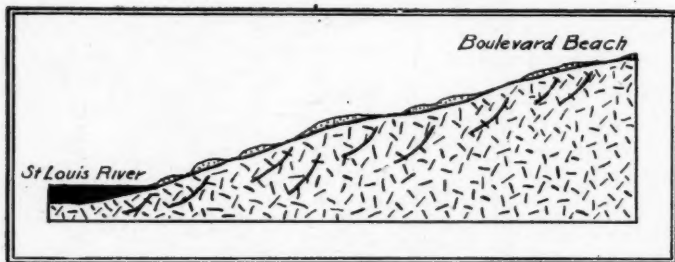


FIG. 5—Profile showing successive beach-terraces in the western part of Duluth.
(*Geography of Minnesota*, p. 206, Hall, 1903.)

The city is built on the slope of a range that extends in a north-east-southwest direction, and rises to a height of about 500 feet above the lake level. Because of this sloping surface the angle which the sun's rays makes with it brings about temperature conditions different from those that would obtain were the surface level. The cold of the winter months is moderated and the heat of the summer is tempered.

Winds. The prevailing wind direction is northeast, the average wind velocity being about 13.5 miles per hour (Fig. 9). It is argued by some that such a wind is sufficient to cause unusual activity among the inhabitants. As one finds it necessary to walk almost daily against a moderate breeze, the resultant energy acquired soon develops into a valuable asset. A brisk breeze also maintains a constant circulation of the atmosphere, thereby preserving its freshness and purity.

Inasmuch as Lake Superior is cooler than the land throughout

the entire year, the prevailing northeasterly winds insure comfortable days during the summer time. During the winter months the winds are mostly from the northwest; therefore, the presence of the cool body of water has little effect upon the temperature.

Rainfall and Humidity. The annual precipitation for Duluth equals 29.61 inches. The minimum, most of which is in the form of snow, occurs during the winter months and early spring. During the summer months, June to September, the maximum amount of rain falls. Comparing this distribution with that of temperature (Fig. 6), it may be readily observed that the variations in these two

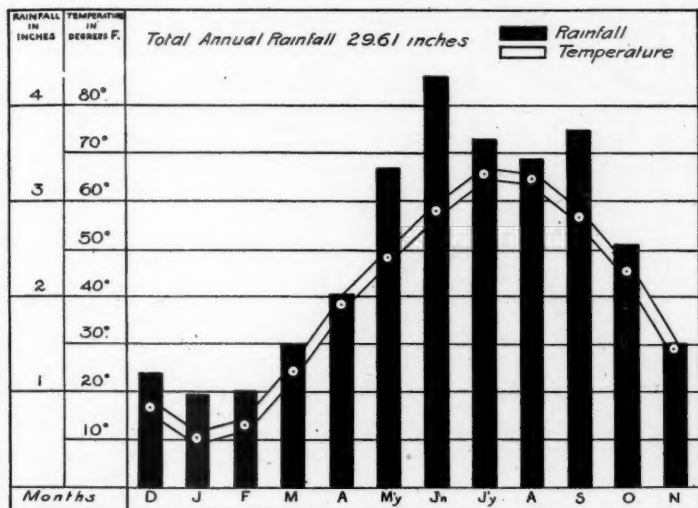


FIG. 6.—Average annual rainfall and temperature for Duluth. (Data from U. S. W. B., Duluth, Minn., average for forty years.)

elements are parallel and nearly equal. At no season are either temperatures or rainfall excessive. The relative humidity, therefore, is not high. As a matter of fact, for the twenty years 1888-1907 inclusive it averages 75.8 per cent. It is lowest in May (69.8 per cent.) and highest in December and January (80.8 per cent. and 80.3 per cent., respectively). Given these elements of rainfall, temperature and relative humidity so normally balanced in a region with a rich soil surface, cultivation of certain hardy products on an extensive as well as intensive scale becomes possible.

Snowfall. Because of the northerly latitude and occasional heavy snowstorms, Duluth is reputed to lie within a snow-bound

area during the winter season. It must be remembered that although severe storms occur, they are the exception and not the rule. The snow covering, on the level ground, from November to May ranges from five to fifteen inches. During abnormal years the depth of

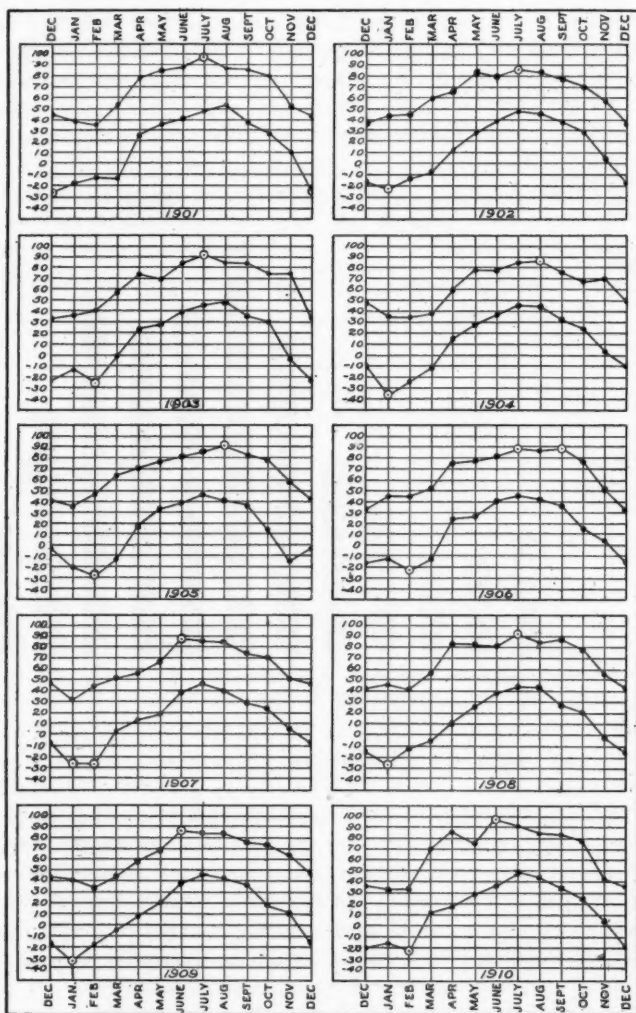


FIG. 7.—Variations in absolute maximum and minimum temperatures for Duluth for years 1901-1910. (Data from U. S. W. B., Duluth.)

Upper curve—maximum temperatures.
Lower curve—minimum temperatures.

snow on the level ground may exceed this range by five or ten inches; however, this condition occurs so seldom it may be considered but a minor factor. With the modern devices at hand the larger cities and the railroads connecting them are able to care for

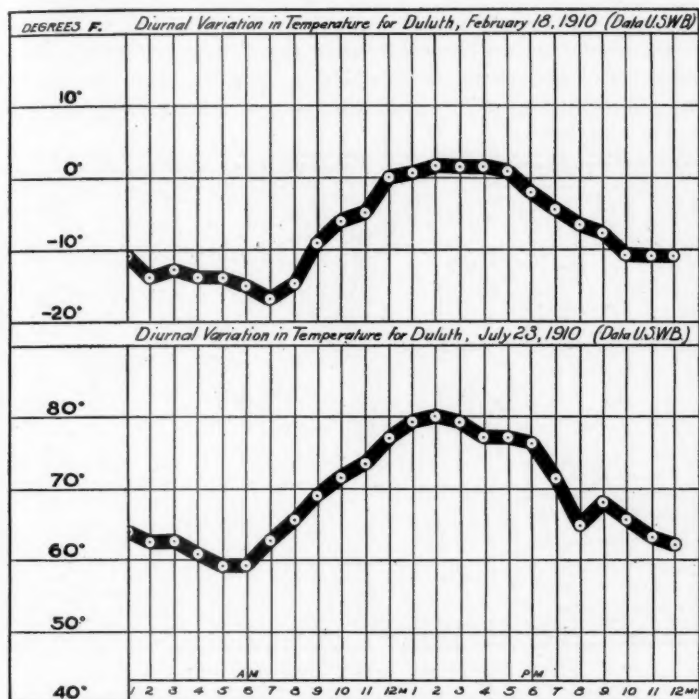


FIG. 8—Showing low temperature in the morning, rapid rise during the day and subsequent fall at night.

themselves very successfully during these winter seasons. Therefore cold, snowy winters, so far as concerns the land area about Duluth, are no great handicap to the city's progress.

Climatic conditions work a hardship upon Duluth in one important respect only. Much of the growth of the city is dependent upon

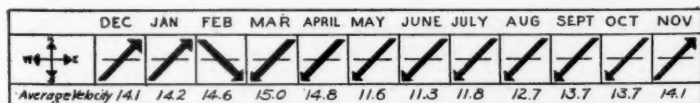


FIG. 9—Prevailing wind. (Data from U. S. W. B., Duluth, Minn., 1904-1910.)

the facilities for navigation. Although Duluth harbor is open practically the year around,* boats which must ply between Duluth and the ports on the lower lakes must close their season at the end of eight months of navigation because of the freezing of the waters at Sault Ste. Marie. Thus, Duluth is handicapped if its boats must cease intercourse during four months of the year. Looking generations ahead, it is not altogether impossible that some means will be provided to keep open the St. Mary's Canal at Sault Ste. Marie even during severe winters, thereby materially lengthening the season of navigation.

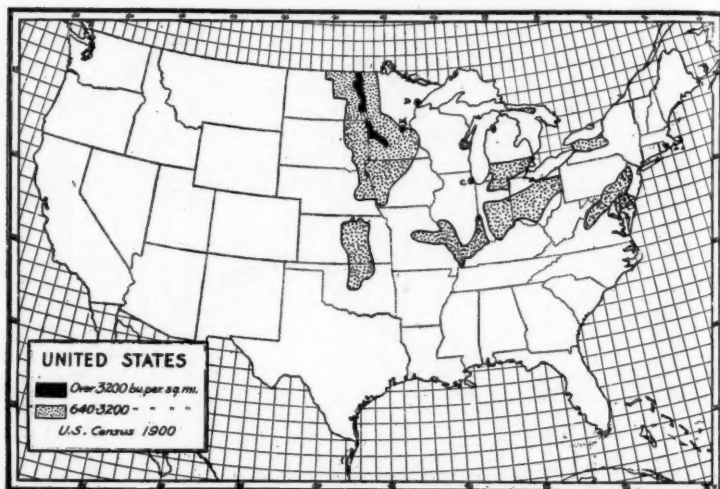


FIG. 10—Principal wheat fields in Central and Eastern U. S.

NATURAL RESOURCES

The natural resources of any locality are always either a positive or a negative factor in its development. These resources may be agricultural, mineral, a combination of both, or neither one, but just facilities for collecting and distributing commodities. Duluth possesses neither of the former on a large scale. The timber that was on the site of Duluth has been a resource worth while, but its disappearance now leaves the city without any extensively developed natural product which it may claim its own. If the city is a distributing center, what does it distribute and whence come the materials?

Agricultural Products. Duluth ships large quantities of wheat,

*See discussion under The Harbor and Water Transportation.

flax, barley, oats, rye, flour and lumber.* Of these commodities, probably that one which leads in Duluth commerce is wheat. The principal productive areas are shown in Fig. 10. The Red River Valley of the North, eastern North Dakota and part of eastern South Dakota ship wheat to the Eastern markets via Duluth and the Great Lakes. By far the greater amount of wheat goes to the East via Minneapolis, although Duluth is the natural geographic center for distribution of wheat to Eastern points. However, things that logically are due individuals or communities are not always secured by

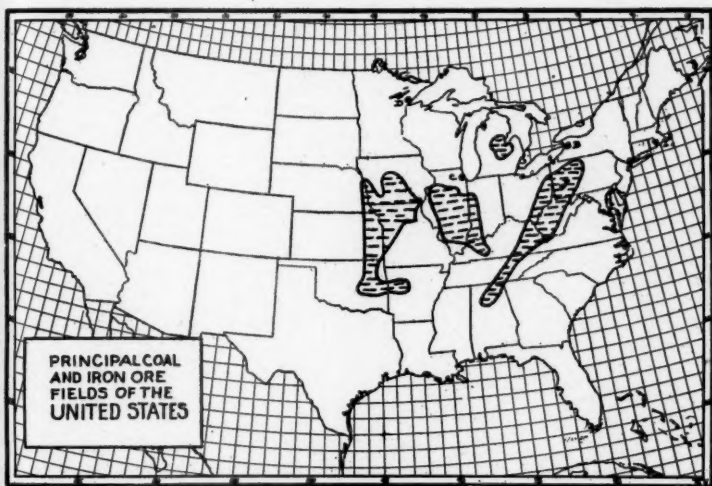


FIG. 11.

them. Railroad rates in many instances have been discriminatory against Duluth, resulting in the diversion of much traffic along other routes. This is an excellent illustration of the influence of artificial factors upon natural geographic conditions resulting in the destruction of the latter. Wheat, a product which should not only add materially to Duluth's welfare but be one of the principal stimuli in its growth and permanence, becomes of relatively little significance. Of the other products, none excepting lumber has held a place of unusual importance in Duluth's commerce. With the disappearance of the forests, the lumber market must disappear.

*In 1910 the following shipments were made: Wheat, 15,091,000 bushels; Flax, 2,118,520 bushels; Oats, 1,186,547 bushels; Barley, 926,222 bushels; Rye, 121,000 bushels; Flour, 1,587,611 barrels; Lumber, 260,678 M feet, Board Measure. Marine Commerce, Duluth-Superior, 1910. G. D. Fitch, Lieut.-Col. U. S. Engineers, Duluth.

A review of the entire list of the agricultural products named above makes striking the fact that the variety, as well as quantity, is small. This limitation necessitates the importation of foodstuffs in large quantities into Duluth for the use of its own citizens. Clearly,

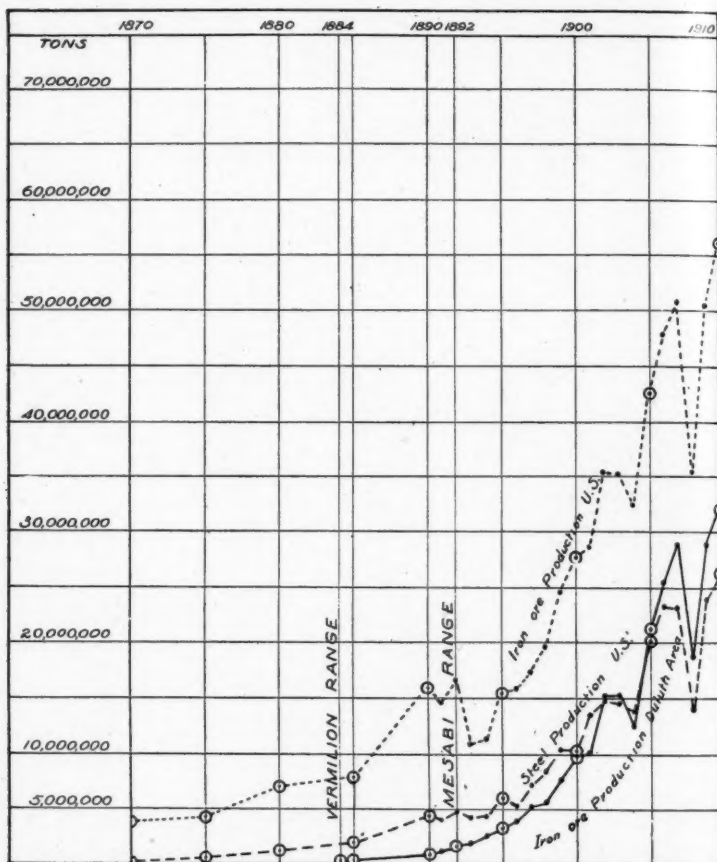


FIG. 12—From Mineral Resources U. S. G. S. Advance Chapter, 1911.

then, Duluth cannot be called an agricultural city, and its rise cannot be attributed in any way to its agricultural environment. If agricultural resources have not played a significant part in Duluth's history, then only one other material resource remains, namely, mineral.

Mineral Products. Within a radius of 100 miles of Duluth is found over three-fourths of the iron ore deposits of the United States. These deposits do not occur in conjunction with coal or limestone, both of which are essential for the manufacture of iron ore into steel. The latter are found in the Pittsburg area. The iron ore can be transported by rail to the head of the Great Lakes, shipped by boat—the cheapest means of transportation—to ports on Lake Erie, and thence to Pittsburg (Figs. I and II). Copper is the only other valuable metal found near Duluth; this is shipped in very small quantities.

Proofs of the significance of iron ore in the world's activities need not be dwelt upon. Suffice it to say: "Next to coal, iron is clearly

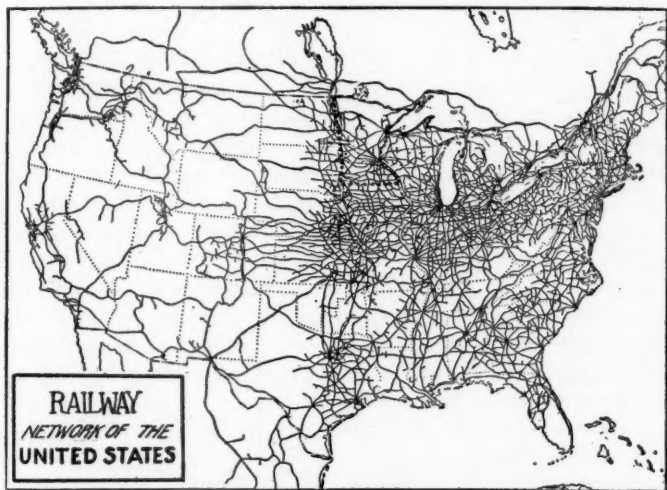


FIG. 13—Based on map in "Development of Commercial Ports" by J. Paul Goode. Chicago Harbor Commission Report.

the most important of the sub-surface products."* This product, fortunately, is located near a water highway that will carry it to the coal and limestone fields necessary for its manufacture. Where the ore breaks bulk—that is, is transferred from train to boats—there will necessarily rise a community of people employed to do the work of transfer. That point in this vicinity has been Duluth, and there Duluth has risen and will continue as long as the iron ore resource lasts.

Ore Production. How large a factor the iron ore of the Vermilion and Mesabi ranges has been in the production of iron ore

* Van Hise, "Conservation of Natural Resources," p. 62.

and steel for the whole United States is shown in Fig. 12. The sudden fall in the curve in 1892-3 is a response to the panic of that period. In addition to that fluctuation, the very rapid rise in the curves for steel and iron ore production for the United States is notable after the opening of the mines northwest of Duluth in 1884 and 1892. Only twice after the opening of these new mines was there a decrease in output, namely, in 1904 and 1908. The curve for total production in the United States corresponds exactly in its fluctuations, after 1893, with the curves for the output of the Duluth ranges—an indication of how closely the total output of the United States is related to the output in the Lake Superior district. The production of steel varies essentially in the same manner.

COMMERCE

The commerce of any city may consist in the exchange of only one kind of product for one from some other region, or it may include the exchange of a great variety of products. These products of exchange may be its own—that is, produced within its own property limits—or they may belong to another city, or other cities. While much of the capital which controls the mines upon the ranges is held by citizens of Duluth, Duluth cannot claim complete ownership to the mines, as a very considerable part of them are owned by Eastern capital. The variety of commodities in the commerce of any city may include largely mineral resources and only small quantities of agricultural products; or it may include agricultural products wholly to the exclusion of other commodities. A number of other combinations still are possible.

Commerce with the East. Duluth may be looked upon fairly as a point for the breaking of bulk of products passing from the Northwest to the East, and not in general as an owner or producer of the commodities shipped. It may be classified with the cities that have the balance distinctly in favor of mineral output as a dominant factor in this commerce. In return for its iron ore it receives principally coal. Coal is brought back from Eastern ports because it is lacking in Duluth and the Northwest, and is therefore of high value in this part of the country.

Commerce with the West. Because of the lack of coal resources in the Northwest, and because the boats returning from the East bring back coal, Duluth becomes the coal-distributing center for the Northwest.* Because of the cold seasons of the Northwest

*Superior, Wisconsin, across the bay from Duluth, shares equally with Duluth in the matter of coal distribution.

and the rough country, where the explorer and settler are still at work establishing civilization of the modern type, heavy clothes are essential for protection against many of the hardships which these people must still endure. In consequence, Duluth possesses an establishment which specializes in the manufacture of heavy clothing. Again, the number of retail clothing establishments is rather large in proportion to the size of the city—a direct response to the rigor of the unsettled country of the Northwest. A total of seventy-five



FIG. 14—Concentration of railroads about Duluth.

clothing establishments gives an average of about one per 1,000 population.

The jobbing of hardware is conducted by two of the largest hardware companies in the United States—a response to an agricultural country which needs implements and utensils of almost every variety, for both outdoor and indoor work.

Four large wholesale, as well as a few retail grocery establishments, distribute their products throughout the Northwest, thereby

supplying the deficiency in variety of foods. The combination of soil and climate is such as to make the growing of grains the most profitable in the list of crops that might be cultivated in this region. Hence, few plant foods are especially grown for the immediate use of the inhabitants. These products of the soil they are satisfied to import from other parts of the country. The principal products included in Duluth's commerce with the West may be summarized as coal, clothing, hardware and groceries.

COMMERCIAL FACILITIES

Railroads. By virtue of its location at the head of the lakes, that is, at the head of a cheap avenue of transportation to the East, and by virtue of the geographic advantages for distribution

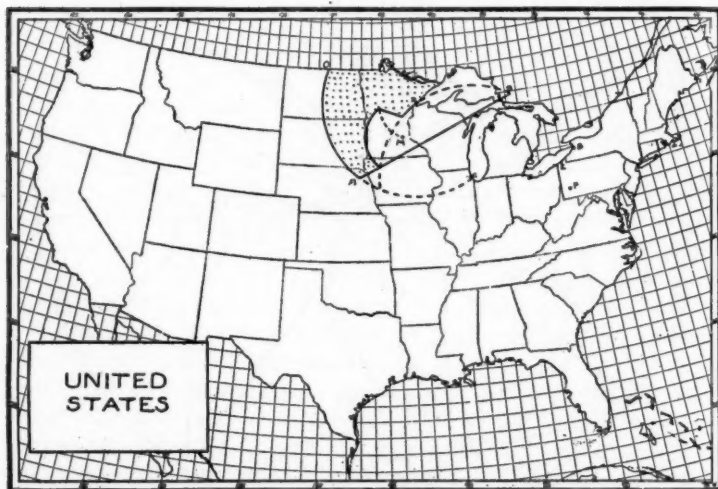


FIG. 15—North of the line A-B territory is nearer Duluth than Chicago. Dotted area is territory to which Duluth is entitled exclusively or should be on an equal competitive basis with Minneapolis and St. Paul. Territory west of curve A-O, in the Dakotas, Northern Wyoming and Montana is tributary to Duluth.

to the West, fourteen lines of railroads radiate from Duluth (Figs. 13 and 14). Fig. 15 indicates the extent of territory which is geographically tributary to Duluth and with which Duluth is in communication. The dotted area should ship its products to Duluth for transportation to the East, because this is most economical for the shipper. Recognizing, however, the fact that trade does not

always follow geographic lines, but is often controlled in its direction by prestige of one route over another, by competition and other artificial influences, the route to the East via Minneapolis and Duluth, or Minneapolis and Chicago, may be justifiable. It has been shown* with regard to rates between the East and the Twin Cities, and also with regard to rates between points in southern North Dakota, South Dakota, southern Minnesota and Minneapolis, and between the same points and Duluth, that the railroads have adjusted their rates in a manner unfair to Duluth.†

As a result of the above conditions, Duluth, though enjoying geographically a location which seems to possess the possibilities of development into one of the world's greatest metropolitan centers, is tremendously handicapped. Until such an adjustment of artificial conditions is made which will be consistent with Duluth's natural environment its growth will necessarily be rather slow.

* "A Memorial *in re* Rail and Lake Rates, July, 1910." The Traffic Commission of the Commercial Club of Duluth.

† Report of Hearing of Duluth Shippers before the Interstate Commerce Commission, *Duluth News-Tribune*, Nov. 23, 1911, and other unpublished data.

(To be concluded.)

THE ILLINOIS PETROLEUM FIELDS

BY

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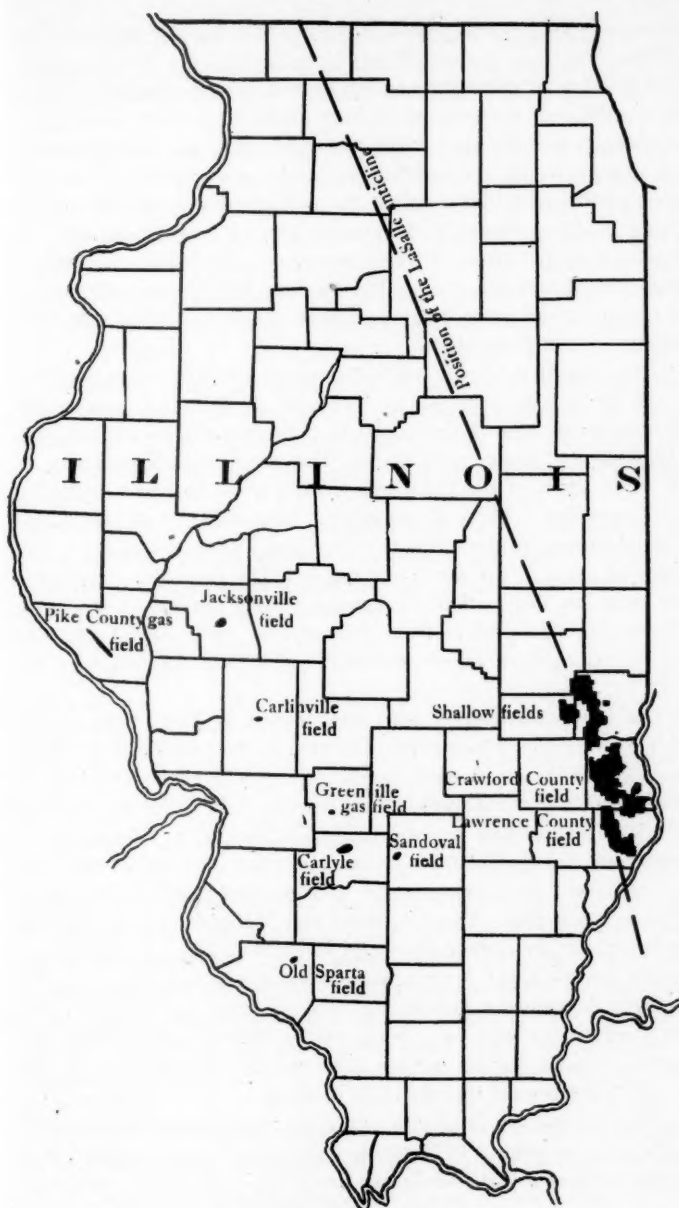
There is no more interesting chapter in the development of American oil fields than that of Illinois. Indeed, its phenomenal growth and rank are unparalleled in this country. Less than eight years ago Illinois was considered unfavorable territory for prospecting because of many unsuccessful attempts to find oil and gas and a prevalent idea that the structure of the State and its relations to the occurrence of oil and gas did not justify the presence of commercial pools. Not only were great fields of high grade petroleum found despite this feeling but also the structure and position of the pools indicate an ideal condition for the accumulation of oil and gas.

Since 1905 about 20,000 wells have been drilled in the State and 85 per cent of these have produced about 158,000,000 barrels of oil valued at \$103,000,000. The present annual yield is over 30,000,000 barrels, with a valuation of about \$19,000,000.

Position of the Active Fields. The main oil fields, from which most of the production comes, lie in the southeastern part of Illinois close to the Illinois-Indiana state line. They are about 165 miles directly south of Chicago and 125 miles east of St. Louis. The fields are 60 miles long and from one to eight miles wide, with an areal extent of about 250 square miles. They are not continuous but are segregated, by coincidence, into three counties, with small portions overlapping adjoining counties. They are, in order from north to south, the Clark (shallow fields), Crawford, and Lawrence county pools. The field next in importance lies three miles northwest of Carlyle, Clinton County, or about forty-five miles east of St. Louis. The field is two miles long and one mile wide, with an areal extent of two square miles. Another minor field lies one-half mile north of Sandoval, Marion County, or about sixty miles east of St. Louis. It covers about three-fourths of one square mile.

History and Present Condition of the Fields. The earliest recorded attempts to locate oil and gas in Illinois were near Casey in 1865, in the midst of the present Clark County pool. Here several wells were drilled, but the work was abandoned. Oil and gas were found, the importance of which would have been appreciated had better drilling facilities been available. Salt water drowned out the oil and prevented an earlier discovery of the present extensive fields. Between 1865 and 1900 several attempts were made to locate oil and gas. Small pools were found near Litchfield, Pittsfield, and Sparta. These are almost wholly abandoned at the present time.

The earlier drilling in Clark County prompted redrilling in the area near Casey in 1904-1905 and resulted in opening the main fields. The first wells yielded initially about thirty-five barrels of oil per day. The development spread rapidly and gradually merged into the deeper pools of Crawford and Lawrence counties until at the present time the main fields are clearly defined and with the exception of small amounts of inside drilling have ceased development. In general the depth of the wells increases consistently from the north to the south. The fields of Clark, Cumberland, Coles, and Edgar counties are called the "shallow" area because the oil usually comes from two sands at a depth of 350 to 600 feet. Such variability of depth is due to structural features of the rocks rather than



Map Showing Illinois Oil and Gas Fields.

to topographic relief, which is very slight in this section of the State.

The boundaries of the productive field in the shallow area were clearly defined in 1910 and include about 60 square miles. There has been practically no development since then and a great many of the original wells are yielding so poorly, as a result of the rapid drain of the field, that they are being plugged and abandoned. The complete abandonment of the shallow areas is not far distant. The combined daily output of the field is about 8,000 barrels, compared with 9,000 barrels in 1910. The shallow fields have been the most profitable in the State because of their depth and small cost of development and production.

The Crawford County field was opened in 1906 and is the largest of the three general pools. It covers in all about 150 square miles. The southeast end of the pool branches into a spur known as the Flat Rock and Duncanville pools. The latter produces a heavy, fuel oil. The sands of the Crawford County pools range in depth from 725 to 975 feet. There is one general sand made up of three locally parallel lenses, but there are, however, small areas where some of the lenses or even all the sands are absent. The extensive development and drain on this pool has caused a general decline of production. The average daily yield from this area in 1911 was about 18,000 barrels, as against 30,000 barrels in 1910 and 100,000 barrels in 1907.

The Lawrence County field was opened in July, 1906, and has since proven the richest producing area in the State. It is distinctive because there are seven sands from 750 to 1,900 feet deep that yield steadily about 42,000 barrels per day. In order of depth and with local names they are the Bridgeport No. 1, 2, 3 lenses, 750 to 1,000 feet; the Buchanan, 1,100 to 1,400 feet; the Kirkwood, 1,350 to 1,650 feet; the Tracey, 1,550 to 1,750 feet; and the McClosky, 1,750 to 1,900 feet. The Kirkwood and McClosky sands, especially the latter, are the richest developed in Illinois. The Lawrence County field covers about forty square miles, and within this area there has been developed a greater per cent. of large wells than in all of the other pools combined. Some of the wells reach an initial production of 2,000 barrels per day, and maintain as high as 1,000 barrels daily for several months after shooting.

With the gradual decline of operations in the main field came the desire for new pools. Wildcatting in Marion County resulted in the development of a small field near Sandoval in 1909-1910, which was

clearly defined in 1911. The oil comes from a sand 1,520 to 1,600 feet deep that is the equivalent of the Kirkwood sand of Lawrence County. There are about 70 producing wells yielding 1,800 barrels per day.

An excellent field was tapped in April, 1911, about three miles northwest of Carlyle, Clinton County. The area was described and recommended by the State Geological Survey* previous to the drilling. The producing sand lies at a depth of about 1,030 feet and is thought to be the stratigraphic equivalent of the Kirkwood sand. The field is governed by an elongated dome on the western flank of the Illinois basin and includes over 125 wells, with a daily yield of about 4,500 barrels.

Production. The total amount of oil produced in Illinois previous to 1905 is negligible compared to the present annual yield. About 98 per cent. of the oil has been refined, while the remaining two per cent. has been sold for fuel. All of the Illinois oils have a paraffine base.

Up to January 1, 1912, about 19,982 wells had been drilled for oil and gas in the State, of which 3,152, or 15.7 per cent., were barren and 16,830, or 84.3 per cent., yielded the following production and value as recorded at the close of 1911:

ILLINOIS OIL PRODUCTION TO 1912

YEAR	BARRELS	VALUE
Previous to 1905.....	6,576
1905.....	181,084	\$116,561
1906.....	4,397,050	3,274,818
1907.....	24,281,973	16,432,947
1908.....	33,686,238	22,649,561
1909.....	30,898,339	19,788,864
1910.....	33,143,362	19,669,383
1911 (estimated).....	30,000,000	19,500,000
	156,594,622	\$101,432,134

Illinois gained ninth place in production and value of oil in 1906 and third place for both in 1907. Since then the State has held third place for production and second for value and has been excelled only by California and Oklahoma. The rapid attainment of such rank among oil producing States of the Union in three years is remarkable when it is considered that other great American fields, and most of them much more extensive, required twenty or more years to attain similar positions.

There have been two declines in the brief history of the oil business in Illinois. The first came in 1909 and was due to disturbed

* Blatchley, R. S., Ill. State Geol. Survey, *Bull.* No. 16, pp. 87 and 167.

market conditions. Recovery was prompt in 1910, but in 1911 continued decline of the early fields and the lack of new development in the later pools caused a second reversal. Unless new fields are discovered the decline must continue.

Prices. All Illinois oil sold at one price varying from 60 to 83 cents per barrel from 1905 to 1907, inclusive. A grading and division in price took place in 1908. The better grades of oil have a gravity between 30° and 37° Beaume, while that of the Duncanville pool lies between 22° and 24°. The development of the Tracey and McClosky sands of Lawrence County gave still higher grades of petroleum varying from 35° to 39°. The difference of gravity necessarily caused a division of price, with the dividing line at 30°. The prevailing price now is 83 cents for oil above 30° and 73 cents for oil below that figure. The continued increase of prices is an inducement for active work in outlying districts where there is hope of finding new fields.

The Ohio Oil Company or producing agent of the Standard Oil Company developed about 40 per cent. of the Illinois fields and with purchased properties now controls 75 per cent. of the total development. This company buys and stores more than 90 per cent. of the oil of the State.

Field Efficiency. The Illinois field is one of the best equipped in the world. There has never been a field of such proportions so well cared for in such a brief period of time. Through the efforts of the Ohio Oil Company, a very efficient system of collecting oil from most of the field by gravity lines has been established. Advantage is taken of the slope of the streams along which the lines are laid after being connected with each lease. The oil flows by its own weight down the lines to a substation where it is caught and pumped back to Martinsville, Ill., and from thence overland, through three pipe lines, to Lima, O. This system has furnished a very profitable saving over the old donkey pump method. The phenomenal growth of the fields necessitated a systematic storage of surplus oil in conjunction with the pipe-line system. Tank farms with over 490 tanks, each of 35,000 barrels capacity, are conveniently located. In order to further systematize the handling of such a field, this same company maintains excellent survey, discharge, and telegraph departments which are in constant touch with the whole field. By this management less than 3 per cent of the oil is lost and that results naturally from evaporation, sediment, and leakage.

The region about the oil fields has been greatly benefited by their

development. The territory first underwent a boom and for a period of several years became a frontier. The activity and rush were similar to that of a new gold strike. Old towns enlarged quickly and new ones sprang up within a very short time. The development added wealth to the community which found its way into improvement of the towns. New schools, paved streets, stores, better dwellings, etc., have taken the place of the once lethargic condition of a mediocre agricultural district. Over \$20,000,000 from royalties alone and perhaps a similar amount for bonuses, labor, etc., not to speak of land valuations, have been left to the landowners.

Geology. In order that the reader may have a general view of the oil and gas conditions of the Illinois fields a brief, elementary review of the geology and origin of the oil is presented. The most conspicuous rocks over Illinois are the Pennsylvanian ("Coal Measures") series of the Carboniferous system or those characterized by coals interlain with shales, thin limestones and sands. They occupy 42,000 square miles in the heart of the State. The oil sands of Clark, Cumberland, and Crawford counties occur in this series. The shallow sands lie high in the Pennsylvanian, while the producing sand of Crawford County belongs in the top of the Pottsville rocks or basal sandstones of this series.

The lenticular Bridgeport sands and the Buchanan sand of Lawrence county belong to the Pennsylvanian. The Bridgeport sand of this county and the Robinson sand of Crawford County are considered in the same horizon, as both of them lie at the top of the massive Pottsville rocks.

The Mississippian ("Sub-Carboniferous") rocks underlie the Pennsylvanian and contain the richest sands of the State. They outcrop around the southern and western borders of the State and are thickest in the southern area, but wedge out to the north. They are penetrated about 475 feet in the main fields and include the "Gas" and Kirkwood sands in the Chester rocks at the top of the series; the Tracey sand of the Cypress or Pre-Chester rocks; and the McClosky sand of the Ste. G  n  vieve. The latter is a soft oolitic limestone overlying a great thickness of hard limestones comprising the major portion of the Mississippian series. This limestone is the most prolific oil horizon in Illinois because of initial flow and steady yield. The Kirkwood sand is the most widespread producing horizon in Illinois. It is correlated with the Carlyle sand of Clinton County, the Benoist sand of the Sandoval field, Marion County, the Sparta sand of Randolph County, and the Oakland City sand of Pike County, Indiana.

General Structure of the State. A number of cross-sections* across Illinois, compiled from well borings and mines, indicate that the central and southern portion of the State lies within a great spoon-shaped basin with its long axis extending from the Wisconsin State line in Stephenson County past LaSalle, Cerro Gordo, Lovington, Olney and into the deepest part of the basin in Wayne, Hamilton, Edwards, and White counties. Towards this basin, with local exceptions, all the rocks of Illinois and of western Indiana dip gently. The rocks on the eastern side of the basin rise rapidly into a conspicuous fold known as the LaSalle anticline, decline gently and then rise again into Indiana. The anticline is exposed in river bluffs near LaSalle and passes from thence in a southeastward direction to Sadorous in Champaign County, past Tuscola and enters the main oil fields of Clark County near Westfield. It continues in a direct line through the oil fields and apparently crosses the Wabash and continues to Princeton, Indiana. The western side of the basin is very gentle and is occasionally interrupted by small deformations such as terraces or domes, along which pools of oil or gas have accumulated.

Probable Origin of Illinois Oil. During the deposition of the sedimentary rocks in the Illinois basin a great abundance of plant life, both marine and land, was laid down with the muds and silts of the accumulating deposits of centuries. These, with possibly some marine animal life, were shut off from the oxygen of the air and other destructive agents and were trapped within the shale deposits, where eventually, through the lapse of geologic time, a peculiar, slow distillation took place, wherein the protoplasm, carbon, and other constituents of the once living matter were converted into oils and gases. The distillation was a matter of ages and its subsequent migration from the shales or limestones to more porous reservoirs by means of capillarity, gravity, and gas or rock pressure was accomplished in additional periods of time. It is thought that the natural distillation of the petroleum and a great portion of its migration to the sands took place while the beds lay horizontal or practically so. There was subsequent folding of the strata which formed the extensive LaSalle anticline along the eastern side and the wrinkling into terraces and domes along the broad, gentle western slope of the Illinois basin. When these disturbances occurred the water, petroleum, and gas within the sandstones were forced to move according to their specific gravities. The water sought the basin, while the oil

* Loc. cit., Plates 7 to 11.

and gas were displaced and forced into the crest of the LaSalle fold on the east and into the small irregular domes and terraces on the west.

It is thought that those oils that have small per cent. of sulphur and are sweet smelling originated from the plant life of the shales, while the oils of large sulphur content and very rank odors came from marine animal life of the limestones. The former oils are found in pure sands, while the latter come from limestones or highly calcareous sandstones.

Results of Geologic Investigation. An investigation of the geological conditions of the main fields was recently made with a view of determining the cause of the accumulation of oil and gas and the relation of the quantities of oil, gas, salt water, porosity of the sand, etc., to the structural features of the sand. The work was based upon the elevations and records of 5,200 wells in the southern half of Crawford and the whole of Lawrence counties.

The Illinois basin and the lower flanks of the LaSalle anticline yield abundant water in all of the productive sands of the main fields. The western limits of the fields are clearly defined and beyond this line the sands are wholly water-bearing, while over the fold most of the sands are oil or gas bearing. It is obvious from the position of the water and oil along the LaSalle anticline that the water has controlled the accumulation of oil in the fold. The water probably has originally permitted the oil to migrate long distances up the slope of the Illinois basin into the arch.

The accumulation of oil and gas in their present position may be looked upon as ideal and is presumably due to the following factors:

1. There is an extensive anticline, with a marked basin on at least one side.
2. The depressions on both sides of the fold, showing abundant water, comprise extensive "feeding" areas for the accumulation of oil in the arch.
3. The sands are commonly porous and hence form suitable reservoirs.
4. There are abundant shales and some limestones overlying the sandstones, which probably serve as impervious covers to the reservoirs.
5. The sands in both limbs of the anticline are abundantly saturated with salt water, which is probably instrumental, by difference in gravity, in holding the oil and gas captive in its present position.
6. Although the general structure of the oil fields is dominated

by a major fold its crest is very irregular and is interrupted by numerous minor domes and transverse depressions, which, together with irregularities of porosity, have been instrumental in segregating the pools.

7. With one exception the best collection of oil was found over the broad flat areas. The domes over the entire field are logical gas reservoirs; but, contrary to expectation, the largest amounts of gas and oil do not lie at the apexes of the domes but a short distance below.

Natural Gas. Illinois produces small amounts of natural gas in proportion to her immense quantities of petroleum. Her present annual yield has a value of about \$600,000 and a rank of eighth among gas producing states. The total value of gas produced in Illinois from 1885 to 1911 is about \$2,649,000. The principal gas areas of the State lie within the main fields near Bellair and Hardinville, Crawford County, and north of Bridgeport, Lawrence County. The gas comes from raised portions of the oil horizon. Many of the oil wells produce small quantities of gas which is used, chiefly, for field operations. There are about forty gas wells that supply towns within or close to the oil fields. Gas is found in less commercial quantities at other points in the State, such as Sandoval, Greenville, Carlyle, Carlinville and Jacksonville.

THE TRANSCONTINENTAL EXCURSION OF THE AMERICAN GEOGRAPHICAL SOCIETY

As the *Bulletin* has already announced, the American Geographical Society of New York celebrates this year the sixtieth anniversary of its founding and the occupation of its new building on Broadway at 156th Street. No form of celebration seemed so fitting as an excursion across the United States, in which an invited party of European geographers should make the journey in company with a number of American geographers, who would show the visitors the most significant of our geographical features, the excursion to be closed by a meeting in New York, when the visitors should be invited to give some account of what they had seen.

The plan thus outlined is now approaching its realization. The

leading geographical societies of over a dozen European countries were requested to select from among their members a number of proficient geographers whom the American Geographical Society might welcome on the excursion.

The sixteen societies which selected the European participants in the Excursion are: k.k. Geographische Gesellschaft Vienna, Austria; Société Royale de Géographie d'Anvers, Belgium; Société Royale Belge de Géographie, Brussels, Belgium; Kongelige Danske Geografiske Selskab, Copenhagen, Denmark; Société de Géographie, Paris, France; Gesellschaft für Erdkunde, Berlin, Germany; Royal Geographical Society, London, Great Britain; Magyar Földrajzi Társaság (Hungarian Geographical Society), Budapest, Hungary; Società Geografica Italiana, Rome, Italy; Koninklijk Nederlandsch Aardrijkskundig Genootschap, Amsterdam, The Netherlands; Norske Geografiske Selskab, Christiania, Norway; Sociedade de Geographia, Lisbon, Portugal; Imperatorskoye Russkoye Geograficheskoye Obshchestvo, St. Petersburg, Russia; Real Sociedad Geográfica, Madrid, Spain; Svenska Sällskapet för Antropologi och Geografi, Stockholm, Sweden; Geographische Gesellschaft, Bern, Switzerland. The list thus constituted, with the addition of a few names otherwise invited, now includes over forty geographers from sixteen different countries, most of the delegates being professors in universities or officers of national geographical societies. It is safe to say that no such gathering of geographers has ever been brought from Europe to America.

The Americans already enlisted, either as round-trip or as temporary members, include, among professors of geography, Barrows and Cowles of Chicago University, Brigham of Colgate, Bowman of Yale, Davis and Ward of Harvard, Dodge and Johnson of Columbia, Fenneman of Cincinnati, Jefferson of Ypsilanti, and Martin and Whitbeck of Wisconsin, as well as a number of scientists from various parts of the country representing subjects allied to geography. Prof. W. M. Davis of Harvard University is Director of the excursion. Thus the party as now made up includes over fifty round-trip members and some twenty or more temporary members.

The number of participants is still to be somewhat enlarged, and correspondence (addressed to the Director, Transcontinental Excursion, American Geographical Society, Broadway at 156th Street, New York) is therefore invited from proficient geographers (men only) who may desire to take part in the excursion for longer or shorter periods, and who can aid the American members already enlisted in

explaining our geographical features to the European members. Place on the special train in which the excursion will be made cannot be promised to all applicants, but it is hoped that all professional geographers who wish to take part in the excursion can be accommodated in one or another part of the route.

The excursion train will leave New York about Aug. 22 and return in the early part of October. The route of the excursion includes Niagara, Detroit, Chicago, Madison, St. Paul-Minneapolis—probably Duluth and the Iron region—the Yellowstone Park, Spokane, Seattle, Tacoma, Portland—probably San Francisco, possibly the Yosemite Valley—Salt Lake City, Grand Junction, Denver, Albuquerque, the Grand Canyon of the Colorado in Northern Arizona, Kansas City, St. Louis—possibly Memphis, Birmingham and Chattanooga—Washington and New York. Numerous stops will be made at points of geographical interest on the way.

A most generous hospitality is promised at many places, where the party will be entertained in local clubs and taken about in automobiles. The cities of the Far Northwest are particularly active. They are planning to take the excursionists up Mt. Rainier, through the superb forest that clothes the lower slopes of this great volcano, to the hotel situated near the timberline, whence the glaciers of the higher slopes may be seen; and also to Crater Lake, the waters of which occupy a huge cavity of engulfment in a once lofty volcano, one of the most remarkable features of the West, although as yet not widely known. Two days will be spent in Washington, where visits will be made to various scientific bureaus of the Government.

The final meeting in New York will be made the occasion of a more general invitation than can be given for a limited excursion on a railway train; and at that time it is desired that the European geographers should have opportunity of meeting a large number of their American colleagues. Due announcement will be made of the place and date of this final meeting, as well as of the speakers and the subjects that they will treat.

DEATH OF GEORGE BORUP

REVISED PLANS OF THE CROCKER LAND EXPEDITION

George Borup, one of the leaders of the Crocker Land Expedition, which was expected to sail from Sydney, N. S., on July 20, 1912, and also assistant Curator of Geology in the American Museum of Natural History, was accidentally drowned on the afternoon of Sunday, April 28, near Crescent Beach, Conn., by the capsizing of a canoe. His friend Samuel W. Case of Norwich, Conn., shared his fate.

Borup was only twenty-seven years old and his loss is lamentable from all points of view. The blow came only three weeks after the great meeting in the Museum lecture hall, where a large and distinguished company assembled to bid Godspeed to the new expedition that was soon to start for Grinnell Land. Young as he was, Borup had won the respect, confidence and affection of all with whom he had been associated whether in the Arctic with Peary, at Yale, preparing for a scientific career, or in the discharge of his new duties at the American Museum of Natural History and in the preparation for the early sailing of the Crocker Land Expedition.

It was his ambition to devote his life to science and to scientific exploration. He seemed to possess every quality essential for the career he had marked out for himself; and the sad accident that took him off cut short, on the threshold of its activity, a life that bid fair to be one of great usefulness and achievement.

Young Borup was the son of Lieutenant Colonel H. D. Borup, U. S. A., retired. He was graduated from Yale University in 1907 and then entered the mechanical department of the Pennsylvania Railroad at Altoona. He had, however, a great yearning for travel and exploration and at length he induced Commander Peary to give him a place as assistant on the North Polar Expedition of 1908-1909, during which Peary attained the Pole. On this expedition very responsible service was entrusted to Borup, who proved equal to every duty that devolved upon him.

After his return home the officials of the American Museum of Natural History, who had become much interested in Borup's scientific ambition and qualities, formulated a line of work and study for him to pursue. He first spent the field season of 1910 in topographic

surveying with a party of the U. S. Geological Survey; then he returned to Yale, where the professors in the department of geology designated the branches of study he should pursue and were greatly interested in the rapid progress he made. He applied himself with the utmost diligence and his sturdy character and fine mentality were shown in his work.

During the vacation of 1911, Borup spent part of the time in the college geological camp among the mountains of Virginia and later he worked in the Museum as an assistant in the department of geology and invertebrate palæontology. Last fall "Professor Gregory of Yale was so favorably impressed with the progress being made by the young enthusiast that he warmly endorsed him for the scientific leadership of an expedition to the far north to verify the existence of Peary's Crocker Land and to do scientific work along many lines—a great enterprise in which he was to share credit equally with Donald B. MacMillan, another of Rear-Admiral Peary's trusted assistants in 1908-1909."

The Council of the American Geographical Society on May 16, 1912, adopted the following minute on the death of Mr. Borup:

"The sudden and untimely death of George Borup cut short a career that gave promise of much usefulness in the fields of exploration and geographical science. Young and modest as he was, his physical vigor, his determined spirit, his ambition to excel, had already stood the severe test of Polar exploration; and his love of science, his gift of imagination so essential in all search for new truth, together with his determination to devote his life to the broader, more modern and useful concepts of geography, and his association with the American Museum of Natural History and the great opportunities it affords, all contribute to make his untimely end, on the eve of an important and promising exploration, a cause of the deepest regret to this Society.

Resolved, that the Council of the American Geographical Society orders that the above minute be spread upon its records and that a copy be forwarded to Mr. Borup's family with the expression of this Council's sympathy in their sorrow."

REVISED PLANS FOR THE CROCKER LAND EXPEDITION

Dr. E. O. Hovey and Mr. H. L. Bridgman, the Committee in charge of preparations for the expedition, have sent a circular letter to the subscribers to the fund announcing the changes that it has been necessary to make in the plans of the Crocker Land party.

The letter says that the Crocker Land Expedition which was to have gone north this summer under the leadership of George Borup and D. B. MacMillan has been postponed to the summer of 1913, on account of the death of Mr. Borup and the impracticability of finding

a satisfactory substitute for him in the short time remaining before the expedition was to start.

The Honorary Committee, consisting of President Henry Fairfield Osborn, Mr. Chandler Robbins, General Thomas H. Hubbard and Dr. Walter B. James; and the Committee in Charge, consisting of Dr. E. O. Hovey and Mr. H. L. Bridgman, have begun preparations for the reorganization of the expedition along such lines as circumstances may necessitate, without changing the main objects of the enterprise, as set forth in the Prospectus issued in January, 1912.

Colonel Borup and a number of the principal supporters of the expedition have united in the formation of a new plan. The expedition will be a memorial to George Borup, the young explorer who was so keenly interested in it and who was the mainspring of its present undertaking.

Mr. MacMillan's connection with the enterprise continues as heretofore and he is utilizing the intervening time for the purpose of making additional preparation for the scientific work of the expedition.

Most of the supplies and equipment for the expedition had been ordered. Some of the orders could be and were cancelled, but the preparation of much of the material was already so far advanced that it could not be stopped. The prepared material will not deteriorate, however, and it has been put into safe storage for use next year, while the special apparatus is being assembled at the Museum. The unexpended balance of the subscriptions already paid in has been deposited in a special interest-bearing account with the United States Trust Co. of New York, where the income will be added to the principal.

As originally planned, the expedition called for \$52,000 to meet its requirements, but the expense of cancelling the steamship and other contracts, of storing supplies for a year, and of changing the personnel of the party will unavoidably somewhat increase the cost of the expedition. The subscriptions already made total about \$36,000, so that the starting of the expedition is assured, though more money is needed for its full success.

CORRESPONDENCE

CLIMATIC CHANGES IN THE NEARER EAST

To the American Geographical Society:

In his "Palestine and its Transformation," Professor Ellsworth Huntington has applied to the lands of the Nearer East his theories of the pulsatory nature of climatic changes and of their relation to history. In so far as by this he means merely the general influence exerted, through long generations, on a particular race settled in a particular country, no historian would disagree with him.* But when he insists that particular facts of history, and those among the most important, are directly the result of climate, it is necessary that the historian frankly recognizes that Palestine and "the surrounding regions furnish perhaps the best of all keys to the climatic history of the whole ancient world,"† and that "the accuracy with which its history is known . . . makes it a standard by which to test conclusions as to regions whose history is less well known."‡ We accordingly have a right to demand that the history of Palestine and Syria "should present a close correspondence between climatic fluctuations on the one hand, and economic, social, and political events on the other."§

It will be our purpose, in the present study, to give in his own words Professor Huntington's explanations for certain facts of history, and then to confront these explanations by the facts in the case. We begin with one of his favorite statements, that there was a "great route, now all unused, [which] led eastward from Egypt across the midst of the desert to Babylonia and the Persian Gulf,"¶ and that "earlier we find a suggestion of similar conditions in Babylonian and Egyptian accounts of the passage of trade and armies across regions now desert."** Yet Professor Huntington cannot point to one single passage in the overwhelming mass of material from the ancient Orient in which we have a reference to such a route. It is true that earlier scholars assumed such a route, but there is no evidence, and a perusal of the actual inscriptions from which Professor Huntington's accounts have ultimately come will show that this is unjustified. For example, he tells us that "King Lugalzaggisi . . . expanded his rule across the desert to Syria . . . It is hardly probable . . . that conquests could have been carried from the mouth of the Euphrates to the Mediterranean in those early days, unless the crossing of the desert were much easier than at present."†† Lugalzaggisi simply lists his conquests, of routes he says not a word, and in all probability his conquests were in Babylonia itself. Professor Huntington believes that it would have been impossible for Sargon the elder to have invaded "distant Syria . . . if then, as now, the desert had been full of plunderers, and the road through Palmyra had been the most southerly that an army could traverse."‡‡ We know of these exploits only from late omen texts, which barely mention the conquest of Amurru, and the crossing of the sea of the

* Cf. Olmstead, *Journal of Geography*, X, 163ff.

† I wish to acknowledge the inspiration, secured long ago from Professor G. L. Burr of Cornell University, which led me to an interest in this branch of study, as well as to active help from my colleagues in the University of Missouri, Dr. F. V. Emerson of the Department of Geography, and Mr. J. E. Wrench, my companion on both of the Cornell expeditions to the Orient.

‡ Palestine, 250. § *Ib.* 251. ¶ *Ib.* 30; cf. 159. ** *Ib.* 375. †† *Ib.* 380f. ‡‡ *Ib.* 381.

setting sun (the Mediterranean). Amurru may be north Syria, though at this time it is probably rather to be found on the middle Euphrates, and an earlier version recently discovered gives instead the sea of the rising sun, the Persian Gulf. Aside from this question as to where the expedition really went, we should note that there is not a word as to route.

Part of Gudea's material, we are told, "came by land across regions where to-day caravans hasten timidly in fear of plundering Bedouin, or do not travel at all for lack of water," and this proves "how peaceful and easily traversed [was] the desert four and a half millenniums ago."* Gudea again simply lists the places from which he secured material for his buildings. There are no topographical indications in the inscriptions, and scholars differ widely as to their identification, though there is a growing tendency to place most of them in or near Babylonia. Meluhha seems to be near the Arabian desert, but this comes close to the gates of his city, and the material from thence need not have been carried far. At any rate, we have nothing approaching proof of such a route. We are told that, in the Kashshite period, "we know . . . that Egypt, Syria, and Babylonia were united by trade of the briskest description across regions which now are desert," and that, with the Aramaean invasion, "between Egypt and Babylonia trade disappeared completely. No caravan could possibly withstand the raids which the hungry desert folk made throughout Arabia."† For the former period, we have a mass of information in the Amarna letters, but there is no reference to any route going south of that by the Euphrates, and there is as little evidence for the second statement.

"The great armies which crossed the desert apparently did not follow the roundabout route through Palmyra or Aleppo, as all modern caravans do."‡ In those cases where we have a detailed enough account to permit exact topography, we regularly have the Aleppo route taken, examples of which are the expeditions of Thothmes I, Thothmes III, Tiglath Pileser I, Ashur nasir apal, Shalmaneser III, Tiglath Pileser IV, Sargon. Esarhaddon and Ashur bani apal, or rather detachments of their troops, did cross the extreme northern part of the desert, but it is perfectly clear that it was not crossed south of Damascus, the goal of the trip. But the language used by the Assyrian scribes clearly shows that this was an extraordinary expedition through a "land of hunger and thirst." So far from the evidence pointing to the prisoners from Israel (sic) being carried to Babylonia "apparently across the desert,"§ the fact that Zedekiah of Judah was taken to Nebuchadnezzar when he was encamped at Riblah in North Syria|| proves that the Babylonians used the Aleppo route.

"In 674 B. C., Esarhaddon . . . led an army from the Euphrates River across the whole desert of Arabia to the remote south. By reason of the absolute absence of water in vast areas, such a march would to-day be utterly impossible."¶ "A little later Esarhaddon conquered Egypt and penetrated to the extreme south of Arabia, where he defeated the Mineans. Such extensive conquests would be impossible unless the desert was easily passable. They furnish strong evidence that remote parts of Arabia were more accessible than now."** As an actual fact, this expedition was connected with the return march from Egypt, and the references to Rapihi or Raphia, where is now the present Turko-Egyptian boundary, and to the stream bed of Musur, the "river" of Egypt of the

* Ib. 382f.

† Ib. 390.

‡ Ib. 272.

§ Ib. 273.

|| II Kings, 25, 20.

¶ Palestine, 375.

** Ib. 400.

Old Testament and the modern Wady el Arish, where is now the first Egyptian outpost, show plainly that it took place not far from the modern route from Gaza to Pelusium. But, so far as we can make out from the mutilated fragments,* even that part of Arabia was far from being "much more accessible than now." In connection with this so-called "river," we are expressly told that this was "a region where was no river"; the water used by the expedition came from wells and had to be drunk from pails; there is mention of "all the camels of the king of Arabia," and though what they did is lost in a break, we are justified in comparing the hiring of camels from the king of the Arabs by Cambyes, in order to have them bring water for the march of his soldiers through this very "dry desert without a drop of water on their way to Egypt."† Furthermore, we hear of stones, of double-headed serpents, and of a region so difficult that it was necessary for the god Marduk himself to come to the help of the king and to infuse new life into the soldiers.

"In the middle of the seventh century, just after Esarhaddon's great conquests," was an outpouring of the tribes, and we are informed that "as early as 660 a slight advance of Indo-Germanic tribes from the dry region to the north began to trouble Assyria." Naturally, all the events up to the Persian conquest are ascribed to a change for the worse in the climate.‡ Unfortunately for the theory, we happen to have for this very period a very definite statement as to the climate. To quote Ashur bani apal himself, "When upon the throne of my father, my begetter [Esarhaddon], I sat, Adad [the god of the atmosphere] poured out his rain storms, Ea [the god of the deep] opened [his springs], the forests grew mightily, the canes grew up in the thickets, so that no one could enter." Then we are informed of the great increase of the lions which inhabited these thickets.§ If somewhat later in the same reign we find mention of a famine in Elam,|| this simply proves that the Assyrians had good years and bad, even as we in America. One passage no more proves that conditions were worse then than does the other that they were better.

"Almost every modern traveller has much to say of the hardships of travel in Sinai, and of the impossibility of its supporting multitudes of people. The ancient writers say almost nothing of this. We can scarcely suppose that they were fools or knaves, and therefore we must believe that they described things approximately as they were."¶ What the ancient writers do say may be gathered from the following extracts from the Old Testament: "Ye have brought us forth into this wilderness to kill this whole assembly with hunger";** water fails for the people to drink;†† the people complain that there is no food but manna;‡‡ there is danger that it will be reported that the Lord has killed Israel in the wilderness;§§ the people complain that "this evil place . . . is no place of seed or of figs or of vines or of pomegranates, neither is there any water to drink,"||| the more striking as our party found figs at one place in the desert, and Professor Huntington himself speaks of the "one or two grape vines which the officials had nursed through the droughts" of a very bad year;¶¶ the fear that the people may "die in the wilderness for there is no bread and there is no water";*** the "great and terrible wilderness wherein were fiery serpents and scorpions and thirsty ground where was no water,"††† which sounds almost like

* The best edition and discussion in H. Winckler, "Untersuchungen zur Altorientalischen Geschichte," 98. † Herodotus, iii. 9. ‡ Palestine, 401 f. § S. A. Smith, "Keilschrifttexte Assurbanipals," II, 2-24 ff. || Cylinder B. IV. 17 ff. ¶ Palestine, 272.

** Exod. 16, 3. †† Ib. 17, 1. ‡‡ Num. 11, 4 ff. §§ Ib. 14, 16. || Num. 20, 5. ¶¶ Palestine, 125. *** Num. 21, 5. ††† Deut. 8, 15.

an echo of the Assyrian accounts;* or the very significant statement in the early Blessing of Moses, "He found him [Jacob] in a desert land and in the waste howling wilderness."† If more proof is needed, we have only to turn to the Egyptian inscriptions to see that there were only Bedawin tribes in the Sinaitic peninsula in their time, that even the very valuable mines at Wadi Maghara and Sarbut el Khadem were not regularly occupied, but were visited by expeditions of such difficulty that the trip was sometimes, at least, made by water, and "a wearisome desert journey in Sinai was thus avoided."‡ It was cause for special congratulation when the "youths returned in full quota, all of them. There was none that fell among them."§ Another caravan leader speaks of "traversing inaccessible valleys, bringing unknown extremities of the world."|| Perhaps the best commentary on Professor Huntington's statement may be seen in the word of the official who writes: "I arrived in this land in the third month of the second season, although it was not the season for going to this mineland . . . When I came from Egypt, my face flinched, and it was hard for me. The highlands are hot in summer and the mountains brand the skin . . . this evil summer season."¶ The weather conditions which could have thus afflicted an Egyptian accustomed to the blazing summer sun of Egypt must have caused the unfortunates who were compelled to travel there to say much of the "hardships of travel in Sinai."

In the study of Hebrew history, Professor Huntington seems hampered by an unconscious apologetic tendency, if we compare his reference to a "certain school of critics who hold that the Biblical authors indulged in undue hyperbole," and his statement that "if the theory [of pulsatory changes] be accepted, a large number of narratives which now seem improbable become reasonable."** It would appear to be due to this that he accepts the numbers of the Exodus, as well as the general fact of such an event, considers that the data in regard to population given by Deuteronomy are at worst only exaggerated, and even can believe in the accuracy of the census of David. An equally distorted perspective seems indicated by his belief that the kingdom "founded by Saul and extended by David" and brought to its height by Solomon "must have been a time when tribes of the desert were at peace by reason of abundant water and forage."†† This exactly reverses things, for the success of David is the success of the half nomadic and more than half uncivilized Judah against the better civilized Philistines and Phœnicians, as well as the somewhat more advanced tribes of North Israel. According to Professor Huntington's own theory, this should rather prove that it was a time of distress, forcing out in layer after layer against the settled folk those tribes nearest the desert, and this might be confirmed by the fact that the great kingdoms of Assyria and Egypt have a time of eclipse at this very period.

"The apparent populousness of Palestine, and we may add of Greece, points to" the conclusion that there was a "general prevalence of relatively moist climatic conditions previous to the Christian era."‡‡ But, as Grundy has so well pointed out,§§ from at least the sixth century onward, Greece did not produce enough food to support the population, and accordingly the great economic necessity behind so much of the political history was the control of the grain trade

* Esarhaddon, cf. n., * p. 434; Ashur bani apal, Rassam Prism, VIII. 87ff.

† Deut. 32, 10.

‡ Breasted, "Records of Egypt," I. 316.

§ Ib. 319.

|| Ib.

¶ Ib. 322.

** Palestine, 250.

†† Ib. 396.

‡‡ Ib. 374.

§§ Thucydides and his Age, *passim*.

from the Euxine. A large population in Greece, therefore, merely proves that South Russia at this time produced enough grain for export and proves nothing as to the fertility of Greece itself. That population decreased alarmingly after the age of Alexander and continued to decrease until long after the Christian era. But we no more need to call in climatic causes to explain this than do we for the conditions which have caused something like fifteen per cent. of the adult male population of Greece to be in the United States to-day. Life in Greece has always been hard and the country has always been overpopulated as regards the food supply. What reduces population is not pressure at home, that is constant, but a suitable outlet. In antiquity, such an outlet was caused by the better opportunities to be found in the "Greece beyond the seas." To-day it is the opportunities for money making in connection with shoe shining parlors or candy shops which are making the maidens of Sparta sing "Anathema be America because it takes away our young men," and the cause of the emigration from Greece is as much to be found in climate as was that in antiquity, that is, not at all.

As to the "favorable conditions centering near the time of Christ,"* we have as much right to deny this because Josephus† tells of a serious famine in the time of Herod which could be stopped only by the importation of Egyptian grain as we have, with Professor Huntington, to say that one of his periods of bad climate is proved by a mention of a famine in the times of Ramses III.‡ His quotation from Strabo§ showing that camel traders travel from Petra to Leucecome with ease and safety "with so large a body of men and camels as to differ in no respect from an army,"|| really proves that so large a force was necessary to guard against desert robbers and that the difficulty of crossing the desert forced the use of camels in place of the much more economical pack mules. The hunger, weariness, and sickness encountered by the army of Augustus¶ sufficiently indicates the condition of the country. We might equally well argue that up to our own days Arabia has been fertile because there have been three great bodies of pilgrims who have gone every year to Mecca, with "so large a body of men and camels as to differ in no respect from an army," one along the western edge of the desert where Professor Huntington admits that to-day we have desert country, one straight across the Sinaitic peninsula, in spite of the "hardships of travel," and a third from Persia straight across the heart of the peninsula. There are no indications in the ancient writers to prove that caravans so large or so frequent crossed the peninsula in antiquity.

That Arabia was to some extent opened up to trade in Roman times is of course well known. But then so is the Arabia of the present day. When Professor Huntington says, "The trade of Arabia was highly important, although now it is practically nothing,"** no one would suspect that this "practically nothing" meant some \$55,000,000 annually.†† We can hardly make the trade of antiquity more. And it is very significant that the exports of antiquity are practically confined to desert products, a fact that hardly tends to make us believe in a great agricultural development. The trade route found by Carruthers was indicated by a well and a guard house. This may very well be the road of twenty days' length which ran from Egypt to Persia. We might think that this tended to support the theory, did we not read also that it ran through the desert

* Palestine, 402. † Agt. xv. 305. ‡ Palestine, 303. § Strabo xvi. 4-23. ¶ Palestine, 274.

¶ Strabo xvi. 4-24.

** Palestine, 273.

†† R. A. Wahab, Ency. Britannica, s. v. Arabia.

and was used only by the postal service,* an exact parallel to the post route of our own day from Damascus across the desert to Baghdad. To prove that conditions have changed in the meantime, we should have been told of villages with indications of agricultural operations where now there are none. But to-day in North Arabia we have such fertile oases as Hail, Tema, Jauf, Khebar, Aneza, Boreda, not one of which can be proved more fertile in antiquity than they now are. Nor should we forget that the only real civilization of antiquity in Arabia was in Yemen, and in the Yemen of to-day travelers "speak with enthusiasm of the wealth of the soil."† We know of course of Ghassanide settlements east of Syria, but these were due only to the protection of Rome.‡ Professor Huntington exclaims, when in the Arabah, "that such a desert was once the scene of active traffic, seems incredible. Yet the next day . . . we were following the track of thousands of ancient caravans."§ Yet he himself has just told us of the pilgrims of the Mecca railway which runs through territory far worse than the Arabah.

The fact that Ptolemy mentions five "rivers" in Arabia,|| or one at Palmyra,¶ no more proves that they were rivers in our sense of the word than does the appearance on our maps of river-like stream beds to-day. In the one case as in the other, we have simply dry stream beds for which the Semites have always had a special term to distinguish them from the true river with constantly running water.

Professor Huntington has written a chapter in explanation of the sudden rise of Palmyra, which he thinks due to abandonment of the more southern routes on account of the growing aridity. But he has first to prove that these routes are as important as he claims,—the Lucian passage certainly does not give this impression,—and then that their abandonment was really due to aridity. The somewhat cavalier dismissal of the "opening of communication by sea" as a cause indicates one of Professor Huntington's greatest weaknesses, a failure to realize the important part played in the history of trade routes by a substitution of one by sea for the old one by land. For instance, he tells us that "increasing aridity, far more than any other cause, has reduced the traffic passing through Samaria to such small proportions that the old trade routes are almost negligible as a factor in the economic and social condition of Palestine."** He forgets that no goods ever go now from Egypt to Babylonia by land, for the steamers to the Persian Gulf have taken the place of the camels, while the coastwise trade, fed by the railroads which enter the country from Jaffa, from Haifa, and from Beirut, and continued in the interior lines northward to Aleppo, and southward to Medina, has made trade by caravan a matter of past history. But the route still remains, for the railroad from Haifa to Damascus and then to Aleppo is nowhere far from the line of the old highway which Professor Huntington now thinks can be safely neglected by the student of economic and social conditions.

An even more striking example of his inability to estimate the importance of sea competition is to be found in his treatment of the route from Gaza into Egypt. "Egypt could hardly have been so keenly interested in Syria, if the two lands had been separated by the deserts of to-day"†† forgets the fact that to-day,

* Lucian, *Rhet. Præcept.* 5.

† Margoliouth, *Hastings' Dictionary of the Bible*, s. v. Arabia.

‡ The "Ghassanide palace of Meshita . . . built by Persian invaders in the sixth century," (*Palestine*, 209,) is a curious combination of the now abandoned theory of Fergusson and of the theory at present dominant.

§ *Palestine*, 219.

|| *Ib.* 273.

¶ *Ib.* 362.

** *Ib.* 407.

†† *Ib.* 269.

under British control, the Egyptian outposts are at Raphia, barely a day's march south of Gaza, that there is an Egyptian governor at Arish, also north of the four days' desert, that but a few years ago there was almost war between Turkey and Egypt over this very country, the trouble resulting in a delimitation commission which gave a good third of the Negeb, including Kadesh Barnea, to Egypt. A survey of the history of this boundary* indeed shows that "age after age Egypt has been in the position of a fortified camp, open to attack on its north-eastern frontier and therefore always having its advanced lines as far as possible on Syrian soil," and this it is which has caused Egypt always to be "so keenly interested in Syria." As to the route itself, the traveler who has marched along it in the month of January with flowers along his path finds it not easy to realize that this is the same route of whose difficulty the ancients have said so much. There is still a fair amount of local traffic, though even this, so far as grain is concerned, is now cut off by the tramp steamers which anchor off the coast at Gaza. As to the through route, who will now be so foolish as to take the expensive ten days' march through the desert when he can, for a few piasters, go to sleep at Jaffa and awaken at Port Said? Professor Huntington compares the "great armies of the ancients" with the "little army of Napoleon." It is to be feared that he has never found out how small these armies really were. It can be stated without fear of contradiction that no ancient army of such a size penetrated so far into the interior of Arabia as did those from Egypt commanded by Tusun Pasha in 1811 and by Ibrahim Pasha in 1816.

"From all the country up to Antioch . . . and to Tarsus . . . the Eastern trade went through Palmyra."† This would demand, for economy of effort, a route running southeast. But the one road, as the remains discovered by Professor Sterrett still show, ran northeast. Further, the road from Antioch to the east, as proved by an exceptionally large number of campaigns, always went by the Euphrates route, while that from Tarsus regularly went through the Amanus Gates, Germanicea, Samosata, Amida, Nisibis, Nineveh, though cases of the route to Birejik and then due east are known. But the point to emphasize is the fact that we never, out of all the numerous accounts of routes eastward from these two cities, have one single case of one running through Palmyra, and indeed a glance at the map should be sufficient to prove its unlikely character.

The immediate cause of the rise of Palmyra to power is clear. It was due to that strange breakdown of the Roman central administration which took place in the third century. Odenathus and Zenobia, like the majority of the so-called Thirty Tyrants among whom they are included by the almost contemporary writers of the Augustan History, were frontier rulers who had taken the opportunity of the breakdown to revolt from the central authority. Their situation in the desert was of special advantage to them because it gave them protection from attack, while their distinctly Oriental character gave impetus to what was essentially a reaction of the east against the west. When the Roman state began to recover from its malady, Palmyra at once disappeared as a power, the result of the attack by Aurelian, and not of an unfavorable change of climate. What combination of social, political, and economic conditions caused this breakdown and the slow and partial recovery which followed, this is not the place to discuss, but we should notice that it is to this same breakdown of government and not to climatic causes that we are to ascribe that dearth of architectural inscriptions from 211 to 324 which has been so much emphasized in the book.‡

* See more fully in Olmstead, Sargon, 61ff.

† Palestine, 343.

‡ Ib. 334.

Professor Huntington was in Palestine in a particularly dry year, and this circumstance has given him a distorted idea as to the amount of water to be found. For example, he says in regard to Petra, "it is almost past believing that such a city could exist in so dry a situation."* The year we spent in Palestine was not, as we found to our sorrow in Galilee, an abnormally wet one. But at Petra we found the stream of water reaching down as far as the Khazneh, while a little above we celebrated the Fourth of July by taking a bath. At the point where the water went underground into the sands of the valley, there was certainly enough water to have filled a pipe of the size of the one which was found almost at this very spot. Accordingly, we may assume that in ordinary summers the people of Petra had as much water as they thought it worth while to make a pipe for.

Other minor points may be noted. Against change in the country about the Lake of Galilee† we still have important springs, while the rock cut aqueduct at Ain Tabigah shows that canals were needed in earlier times. No argument can be made from the accounts of Josephus, for it has long been recognized that he exaggerates as much here as he does in the case of the population of Jerusalem. The elaborate picture of Engedi drawn by Professor Huntington‡ finds little justification in the "wilderness of Engedi," where David was able to flee from Saul,§ or with the listing of it as one of the villages of the wilderness.|| That in the late Canticles we should have a reference to "vineyards of Engedi"¶ is not surprising, but the admission of Josephus that it is a small place (πολιχνη)** means much in a writer who always grossly exaggerates.

The Negeb question has already been discussed in detail elsewhere,†† and it has been there shown that the lack of artificial mounds, of pre-Hellenic pottery, the references in the Old Testament and in the other pre-Christian literature, all prove that there was no more than a semi-nomadic population here. To that we may add that the evidence of the crops is by no means in favor of a great difference between antiquity and now. The only crops of which, so far as I know, we can be sure in antiquity are the cereals and grapes. Comparatively few acres are covered by the heaps of flint on which these grapes were trained, and indeed but a small part of the country, on the evidence of the remains, was cultivated in antiquity. This was only where there was actual water from the wells and water holes, or on the lower slopes of the apparently dry stream beds where the water seeping through the soil appears in the frequent themail or water pits. Professor Huntington tells of grape vines nursed through the drought. My note-book often speaks of grain fields which compared favorably with those seen to the north; now and then we found tobacco patches; durra grew on the edge of the sand dunes as if American corn, and we once found figs. When we remember that the land is still held only by semi-nomadic Bedawin, we are not surprised to find that the methods are of the crudest and the results comparatively poor. Nor can we, even for antiquity, demand that the inhabitants secure all their food from the nearby fields. Even if they had crops of grain, there is no need of assuming that vegetables and fruits need have been grown here. My own university town is about the size of Sebeta in the Negeb and is the center of a rich agricultural region, but we secure our vegetables by way of St. Louis. How much more this must have been true as

* *ib.* 222.† *ib.* 14.† *ib.* 179.** *Bell. Jud.* iv. 402.‡ *ib.* 101ff.§ 2 *Sam.* 24.†† *Olmstead, Sargon*, 56ff.¶ *Joshua* 15, 62.

the main reason for the development of these towns was to be found in their position of advantage in trading with the more desert regions further south.

Because the poverty ridden peasant or semi-nomad, with no reserve to fall back upon in bad years, cannot now make a living in a semi-arid country is no reason why it could not be done in Roman times when capital was abundant and capitalists controlled the peasant, already half a serf. Only our own days have seen the accumulation of capital comparable to that of the period when the Negeb cities were built, and even now we see many failures—for example, Garden City in Kansas, where just this lack of a reserve has caused the farmer to give up the attempt to carry on his farming in the face of a series of bad years. When Professor Huntington demands that Beersheba and Aujeh "raise good crops every year,"* he demands more than any American farmer, in much more fertile country and with all his argicultural knowledge, has a right to expect.

We have thus tested in detail a considerable proportion of the facts which Professor Huntington has cited to prove the theory of pulsatory climatic changes. Some have proved to be no facts at all, others seem to prove the exact reverse of his theory of the development. In these explanations, he has minimized or entirely omitted recognized causes along geographic, social, economic, and political lines. He seems to have claimed for his theory all facts which at first sight seemed to be in favor of it, without analyzing the antecedents or testing it for modification or rejection. Probability may well be in favor of a gradual movement towards aridity over the entire globe, and there may have been such fluctuations as the theory demands. But it is evident that Professor Huntington has not used his material with adequate care, his periods cannot be shown to agree with such facts as we have, and the historian, for the present at least, cannot use his results in writing his detailed history.

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CLIMATIC CHANGES IN THE NEARER EAST: A REPLY

To the American Geographical Society:

An article such as that of Professor Olmstead in the *Bulletin* is of great value in emphasizing the fact that there are two sides to every question. I recognize that in the earnestness of the pursuit of a new and engrossing theory I am in constant danger of doing what Professor Olmstead accuses me of, namely, claiming for the theory "all facts which at first sight seem to be in favor of it without analyzing the antecedents or testing it for modification or rejection." Therefore I welcome all such criticisms, and am ready to modify my theories so as to bring them into accord with the facts. It must be borne in mind, however, that I have nowhere claimed finality for the climatic curves which I have published, nor for the theories which they represent. The whole conclusion to which the facts set forth in "The Pulse of Asia" and "Palestine and its Transformation" have led me is summed up in the preface to the latter book in the statement that "the climate of the past five thousand years has been

* Palestine, 282.

subject to numerous changes, (and) these *may have been* a potent factor in the guidance of *some* of the greatest events in history." I emphasize the words "may have been" and "some" because I do not want to be understood as claiming that climatic changes are anything more than one of several important but, as yet, little understood factors, which may perhaps have co-operated with the well-known political, social, and religious factors upon which historians have rightly laid so much emphasis. My attitude toward the whole matter is expressed on page 403 of "Palestine and its Transformation," where I present a curve entitled "Approximate Climatic Fluctuations of the Historic Period." The statement is there made that, "The line representing climate—as here given—makes no claim to finality. The researches of a single year may cause the shifting of a curve a century or more, or may smooth out some minor curve and add another. Yet in its main features I believe that it will stand."

The investigations of the two years since these words were written have strongly confirmed me in the opinion expressed above, and Professor Olmstead's article, while most welcome as pointing out certain minor errors, does not in the least alter that conviction. When the smoke of his article clears away, it will appear, I think, that he has merely attacked a minor outpost and not the main fortress, and that, even so, his attack has not been successful. Let us proceed to count the dead and measure the breaches in the walls.

The first point upon which Professor Olmstead lays stress is that I have assumed the existence of trade routes across the Syrian desert in places where there is no evidence of any such thing. He attempts to prove this by informing us that Lugalzaggisi says nothing about the exact routes which he followed, that the sites mentioned by Sargon and Gudea have hitherto been wrongly identified, and that the Amarna letters make no mention of any route going south of that by the Euphrates. But what does this signify? It merely indicates that if scholars disagree about the extent of Lugalzaggisi's conquests and the places mentioned by Sargon and Gudea we must leave those particular pieces of evidence in abeyance. In writing about these matters I followed good authorities, those that are reputed highest, but if later research places their results in doubt, that by no means disproves the theory of climatic changes, nor does it indicate that there were no roads across the desert. It merely leaves the matter unsettled. Curiously enough Professor Olmstead does not see fit to finish this subject in the paragraph under consideration, but defers it until he takes up the discussion of the conditions at about the time of Christ. There, with apparent forgetfulness of what he has said before, he speaks as if it were a well recognized fact that in those days there existed trade routes which now are not passable for caravans. The well and guard-house east of Petra, which I have described on the authority of Carruthers (Palestine, pp. 275-277), seem to be accepted by Professor Olmstead as conclusive proof of an ancient road leading from southern Palestine and Egypt to the Persian Gulf. His comment on it is that "this may very well be the road of twenty days' length which ran from Egypt to Persia." To-day there is no possibility of such a road by reason of lack of water, as the Arabs themselves plainly state and as the explorer Carruthers has well shown. Professor Olmstead further informs us that according to Lucian, who lived from about 120 to 180 A. D., and whose writings belong to the period from 150 to 180 A. D., this road "ran through the desert and was used only by the postal service, an exact parallel to the post-route of our own day from Damascus across the desert to Baghdad." If Professor Olmstead had looked at the diagram of

"Approximate Climatic Fluctuations during the Christian Era" on page 327 of "Palestine and its Transformation," he would have seen that by the time of Lucian there already seems to have been some decrease of rainfall as compared with the time of Christ. In a word, Professor Olmstead's contribution to our knowledge of routes in the Syrian desert comes to this: he throws doubt on some of the identifications of sites and routes which I had supposed to be correct, but which are at best of only slight value because they date back so far that at present any exact knowledge concerning them is impossible. Second, as to the days of Rome's greatness, when, according to the hypothesis under discussion, conditions were drier than in the days of Sargon, but nevertheless much moister than now, he accepts the evidence of the ruined guard-house as proving that a road existed where none can now exist for lack of water; and furthermore he speaks of this as if it were a well-known road. Finally at a period 150 years after Christ, when, according to the hypothesis, aridity had increased somewhat, he says that this road was merely a post road, and adds the unproved statement that it was "an exact parallel to the post route of our own day from Damascus to Baghdad." The Damascus-Baghdad road was used only a few years when the British were trying to establish quick communication with India, but it proved too difficult and was abandoned. It is quite possible that after the days of Lucian the road from Egypt eastward fell into the same state as that of the Damascus road in the nineteenth century; now it is far worse. Professor Olmstead advances nothing which is in any way inconsistent with the theory of pulsatory climatic changes and much which fits that theory and does not fit the theory of climatic uniformity which he is endeavoring to support.

Another of the points to which Professor Olmstead frequently refers is that ancient accounts from the very earliest times indicate that Arabia was always a desert. Of course it was. No one doubts this for a moment, and nowhere have I consciously given any hint to the contrary. Yet Professor Olmstead, when speaking of the supposed roads across the desert, remarks that "to prove that conditions have changed . . . we should have been told of villages with indications of agricultural operations where now there are none. But to-day in north Arabia we have such fertile oases as Hail, Tema, Jauf, Khebar, Aneza, Boreda, not one of which can be proved more fertile in antiquity than they now are." This quotation is illuminating in two ways. It shows, first, that the critic is quite as liable to make rash statements as is the criticised. The fertile oases whose names sound so well are miserable little towns scattered over an area about 500 miles square, the only places worth mentioning in 150,000 square miles of desert. I think that I am safe in saying that no one of them has ever been visited by any man who has had the necessary geographical training and also the time and freedom adequately to investigate the matter. I know that I am safe in saying that no account of any such investigation has ever been published. Professor Olmstead's statement that no one of these can be proved to have been more fertile in the past than at present is absolutely without foundation.

The quotation as to oases and as to villages in the desert is illuminating in another way. It shows that in writing upon this subject I have not taken due account of the fact that in the nature of things the historian or the general reader cannot be expected to have much idea of the true nature and causes of climatic phenomena. Professor Olmstead seems to have gained the idea that my theory of climatic changes demands that the desert shall at some time have blossomed as the rose. I have emphasized the fact that the change of climate demanded

by the hypothesis is not radical. Here is what I have said on page 261 of "Palestine": "It would be a great advantage to Palestine if the winters were a few degrees colder, so that snow fell more abundantly and stayed longer than now, and if the rainy season were a little longer, so that there would be less danger of drought in the critical seasons of fall planting and spring growth. In the following pages it must be borne in mind that no greater changes of climate than this are postulated . . . If the climate of Palestine during historic times were ever different from what it is to-day, it probably resembled that which would now prevail along the *Ægean* coast of Asia Minor if the relief of the land and its relation to the sea were like those of Syria." As I was dealing mainly with Palestine I assumed that a statement of the effect of such a change upon the desert was not necessary. Any one possessed of a moderate knowledge of climatology would know that a change of the kind here indicated, while it might have profound effects upon man, would not make the desert habitable. It would merely increase the size of the areas of cultivation along the edges of the desert, it would increase the amount of grass and forage in the desert, it would make the springs more numerous and the wells less likely to dry up, and it would enlarge the available water supply of the oases and thus enable them to support a larger population. In "Palestine and its Transformation" I have given many instances where it seems to me that just these effects have followed. Professor Olmstead has ignored these, which are the strongest buttresses of the theory of pulsatory climatic changes, and has devoted himself to proving that Sinai and Arabia were always deserts, a contention which is perfectly in accord with the theory that he attacks. They were deserts, and the man from the oasis or from Egypt must always have suffered when he tried to cross them, but they were apparently deserts in which the watering places and the forage were somewhat more abundant than now.

I might go on to show other cases in which Professor Olmstead has failed to grasp the full import of what I have written. This may be due to lack of clearness and precision on my part, and if so I must beg for pardon. For instance, in discussing the Exodus Professor Olmstead takes no account of the fact that my climatic curve shows a period of comparative aridity at that time, an aridity which may have had much to do with the movements of the early Hebrews. I have everywhere assumed that while a few Israelites may have come from Egypt, the majority came probably from the desert. Again, Professor Olmstead refers more than once to the vines which I mention at Aujeh in the Negeb. Here is what I have said about the matter: "The [ruined] walls and terraces just described were . . . manifestly intended . . . for olive groves, vineyards, orchards, or vegetable gardens. To-day, except for the few tiny gardens watered by the gasoline pump at Beersheba, no trace of such plants is to be found in the Negeb, unless it be one or two grape vines which the officials of Aujeh have nursed through the droughts." I ought to have added that these vines were only a year old and that most had already died. Even in a desert a man with a bucket and a well can nurse a few vines through a drought.

It would be tedious to go into these matters further, but before turning to something more interesting and conclusive I feel that it is right to call attention to the rash way in which Professor Olmstead has used figures and to his extreme inaccuracy. On page 436 he says: "When Professor Huntington says, 'The trade of Arabia was highly important, although now it is practically nothing,' no one would suspect that this 'practically nothing' meant some \$55,000,000 an-

nually." He quotes the *Encyclopedia Britannica* as his authority. Let us analyze the figures there given. They are as follows:

Aden, £6,000,000, imports and exports combined.
 Jidda, £1,405,000 imports, £25,000 exports.
 Hoheda, £467,000 imports, £451,000 exports.
 Oman, £550,000, of which two-thirds are imports and one-third exports.
 Bahrein, £1,900,000 half imports, half exports.
 Total, £10,773,000.

Out of a total of nearly £11,000,000 sterling, £6,000,000 belong to Aden. Aden is in truth a part of Arabia, but its business has practically nothing to do with that country. In the first place, it is a British colony, and its sole importance is as a port of call. Its population of over 40,000 has to import everything which it eats or wears. So far as the necessary materials come from Arabia they are included in the figures for other ports as well as for Aden. Moreover, its exports are practically confined to the re-exportation of articles which have been imported. In other words, Aden is merely a place of exchange. Practically its entire trade must be deducted before we can arrive at a true estimate of the real value of the trade of Arabia: Jidda, the next place on our list, is the port of Mecca. The disparity between its exports and imports is enormous. This means that the large amount of importation is due to the necessity of supplying food for the throngs of pilgrims. It is paid for by money which the pilgrims bring from other lands. Therefore except for the £25,000 of actual exports and another £25,000 of imports to balance this, we may fairly say that Jidda has no trade originating in Arabia. Passing on to other towns of our list, we find that all the trade of Hoheda, the port of Yemen, belongs to Arabia unquestionably. Oman, however, is only technically a part of Arabia. In all discussions such as that in which we are now engaged it is so far remote—1,500 miles from the Dead Sea—and looks out so completely toward the eastern ocean and not toward the lands around Palestine that it does not enter into the problem of the relation of the trade of Arabia to the surrounding countries. Bahrein, likewise, is remote and scarcely enters into the problem. It is an island in the Persian Gulf, its exports are largely pearls, and its imports are paid for by the pearls gathered from the sea. Thus it is seen that while Professor Olmstead is technically right in saying that the trade of Arabia amounts to \$55,000,000, he is wrong in a much truer sense. His statement is one of those misleading truths which lead to wrong conclusions. So far as the problem now in hand is concerned, the trade of Arabia amounts to less than £1,000,000, and practically all of that is in Yemen, 1,400 miles from Palestine. This small sum of \$5,000,000 represents the trade of an area about half as large as the United States. The city of Portland, Maine, whose population amounted to 59,000 in 1910, had a trade of \$16,000,000 in 1907 and of \$12,200,000 in 1908. It seems justifiable to say that, so far as the problem now before us is concerned, the trade of Arabia is "practically nothing."

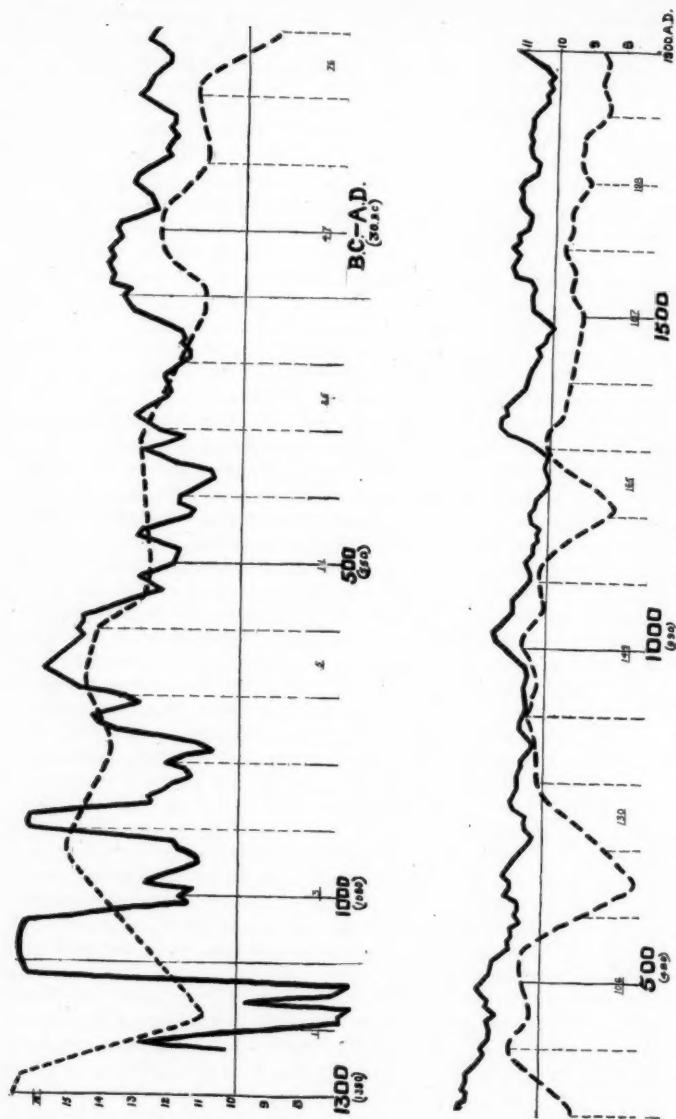
Professor Olmstead is not only careless in his use of figures, but he is far from careful in his representation of the views of others. A comparison of two quotations will illustrate the matter. Professor Olmstead makes the following statement: "[Professor Huntington] accepts the numbers of the Exodus, as well as the general fact of such an event, considers that the data in regard to population given by Deuteronomy is at worst only exaggerated, and even can believe in the accuracy of the census of David." Here is what I have actually said:

"It may be admitted that many or even most of the details as to the wanderings of the Israelites are inaccurate, and that there is much exaggeration. It can scarcely be denied, however, that the story has an historical basis . . . In the records handed down to us the number of invaders may have been multiplied ten-fold or twenty-fold, but it must have been large" (p. 271 "Palestine, etc."). "In David's time the population, according to the census which he took, is reported to have been between five and six million. Most authorities agree with Hilderscheid, one of the strongest opponents of the theory of climatic change, who says that although these figures may be regarded as 'in Oriental fashion greatly exaggerated, yet it cannot be doubted that the population of that time was much more numerous and dense than it has now become'" (p. 263). If all Professor Olmstead's statements are on the same plane as those in regard to the present trade of Arabia and my belief in the accuracy of the census of David, his whole contention falls to the ground.

I might go on to discuss other points raised by Professor Olmstead, but the dissection and criticism of another man's arguments are apt to prove wearisome to the reader. Let us turn to something constructive. In the present discussion two points are at issue—first, the verity of my hypothesis as to the actual existence of climatic changes on a large scale and extending over large periods; and second, the possible effect of such changes upon historic events.

This second problem belongs primarily to the historian; the task of the geographer is to establish his own conclusions as a sound basis upon which his historical colleague can work. Therefore I shall turn to the purely physical side of the matter. In order to test the conclusions formed in Asia, I went to California in the summer of 1910 and 1911, under the auspices of the Carnegie Institution of Washington, and among other things made use of a method which was originally suggested by Professor A. E. Douglass of the University of Arizona. In dry regions like Arizona the growth of trees depends almost entirely upon the amount of winter precipitation. If the snow falls heavily during the winter and the rains last well into the spring, the long summer season of drought has comparatively little effect, and the trees add to their trunks a thick layer of new wood. In dry seasons the reverse naturally takes place. It is evident then that by measuring the thickness of the rings of annual growth upon the stumps or trunks of trees that have been cut we can determine the relative amount of rainfall at any period during their growth. Accidents will, of course, affect the growth of individual trees, but actual experiments show that when a sufficient number of trees is used the effects of individual idiosyncrasies and even of such things as forest fires disappear, and the curve of growth corresponds closely to that of rainfall. To be sure, certain corrections must be made in order to eliminate the difference in the rate of growth of young trees and old, but the corrections are purely mathematical and can easily be made provided sufficient trees are available.

In California I measured the rings of about 200 of the so-called Big Trees, or *Sequoia gigantea*, high on the slopes of the Sierra Nevadas. The resultant curve is given herewith, the solid line. Horizontal distance represents the course of time, while vertical height represents the rate of growth. Where the curve is high the trees grew fast; where it is low they grew slowly. The numbers in parentheses below the dates at the bottom of the diagram represent the maximum probable error in ascertaining the years. The error may be much less than is indicated; it can scarcely be more. The small numbers within the body



Diagrams showing rate of growth of the "Big Trees" of California at different periods.

of the diagram represent the number of trees used in preparing the curve. Back of about 500 B. C. the number is so small that the degree of accuracy is not high. From 200 B. C. onward there can be practically no question as to the general accuracy of the results, although further investigation may necessitate minor modifications. There is, however, some question as to whether the low places should not fall somewhat lower than they do, but this is immaterial for our present purpose. It arises from the fact that the final mathematical corrections cannot be fully applied until more trees have been measured. Whatever changes may be made by further investigation and measurement, however, it is practically certain that the general sinuous form of the curve will remain, for a similar sinuosity is characteristic of the curves of growth of numerous other species. Moreover, within the species the sinuous form appears in the same fashion no matter whether one takes one group of trees or another. It seems to indicate, and I may almost say proves, that the climate of California during the past 2,000 years has not only grown drier, but has also been subject to pronounced pulsatory changes.

Beside the curve of the trees from California I have placed another, that of the approximate climatic fluctuations of western and central Asia as given on pages 327 and 403 of "Palestine and its Transformation." This is the visual expression of the theory which Professor Olmstead criticises. The curve is far from final; many portions of it, as I have shown again and again, are based on fragmentary evidence, and will be modified as soon as more data are available. Everything now seems to indicate that each change in the Asiatic curve will bring it more into harmony with that of California. Even as the curves now stand there is a marked degree of similarity, which in some cases, such as the periods centering at the time of Christ and 1000 A. D., extends to details. The lesson of the curves is obvious. We have before us two attempts at a reconstruction of the climatic conditions of the past. One, that of Asia, is based on fragmentary evidence of many kinds and is full of the errors which are inseparable from work of a new kind. It is also full of the errors which arise because of the prepossessions and personal equation of the investigator. The other is a continuous record based on purely mathematical considerations. It cannot be changed by the investigator's private opinion and predilections. Yet the two curves in the main agree. They both indicate that the climate of the earth is subject to changes, and that those changes are of a pulsatory nature. Moreover, the changes as indicated in the California curve are of sufficient intensity to cause serious modifications in the economic conditions of the inhabitants of the country. Therefore they must have had distinct and recognizable historic results. Farther than this I do not now care to go. I may have misinterpreted the results in many cases, but little by little we are approaching the point of certainty as to the nature and date of climatic pulsations. With each step we are drawing nearer to the point where we, the geographers, can say to the historians, "Here are the definite facts as to changes of climate. What results have they produced?"

ELLSWORTH HUNTINGTON,

Yale University.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

CAPTAIN AMUNDSEN'S CABLEGRAM. Capt. Amundsen cabled the following to President Huntington on March 19 in response to the President's message of congratulation in behalf of the Society under date of March 11 printed in the *March Bulletin*:

Mr. Huntington, President American Geographical Society:

Sir: With the heartiest thanks for your kind telegram.

Yours very truly,

ROALD AMUNDSEN.

AN EXHIBITION TO BE GIVEN AT THE SOCIETY'S HOUSE. At the meeting of the Council on Thursday, May 16, the working staff was authorized to collect photographs and other material to be exhibited in the large rooms on the first floor of the building. The plan is to show representative scenes in those parts of the country which will be visited by the Transcontinental Excursion, such as panoramic views of cities, the prairie of Glacial Lake Agassiz, the Bad Lands of the Little Missouri, the Minnesota Iron Mining District; views of one or two of the larger reclamation works with bits of arid plains before improvement and after; views in the Yellowstone, Glacier, Crater Lake, Mt. Ranier, Yosemite, Sequoia and Mesa Verde National Parks, the Grand Cañon of the Colorado, etc.

It is intended that the exhibition shall be ready by the time the foreign delegates on the Excursion begin to arrive in this city. After the departure of the Excursion for the west the exhibition will be open to members of the Society and the general public.

THE ATTENDANCE AT OUR LECTURES. During the past session 3,766 persons attended the six popular lectures given by the Society in the auditorium of the Engineering Society's Building.

NORTH AMERICA

MAGNETIC DECLINATION IN THE UNITED STATES. Special Publication No. 9 of the Coast and Geodetic Survey contains a magnetic declination chart for the United States for the epoch Jan. 1, 1910. After the publication of the isogonic chart of the United States for 1905 so much additional data were accumulated and the secular change of the magnetic declination underwent such material modification that a new chart was demanded. Jan. 1, 1910 was selected as the epoch for the chart in order that the reduction of the observations to that epoch might be based on actual observations of the secular change.

West declination is increasing much more rapidly in the North Atlantic States than was supposed in 1905. The annual change is now about 6' throughout New England. On the Pacific coast east declination is increasing more rapidly than in 1905, but the region of the maximum annual change is now apparently some distance inland.

The north end of the compass needle is moving to the westward at all places east of the line of no annual change and to the eastward at all places west of that line. Accordingly, three regions may be distinguished:

- (a) In the region of the United States east of the line of no magnetic de-

clination (agonic line) west declination is increasing at an annual rate of from 2' to 6'.

(b) In the region between the agonic line and the line of no annual change east declination is decreasing at an annual rate of from 0' to 2'.

(c) In the region west of the line of no annual change east declination is increasing at the annual rate of from 0' to 5'.

Under present remarkable conditions it is impossible to predict with accuracy what the secular motion will be for even a few years in advance. There appear to be two waves of secular motion progressing across the continent in opposite directions, but it is impossible to state which one will predominate. Interesting developments may be expected in the next few years.

West declination is increasing about 7' a year in Bermuda and about 9' a year at the Porto Rico Magnetic Observatory on Vieques Island.

ALUMINUM IN THE UNITED STATES. Aluminum, a few years ago a rare metal, too expensive to have any particular economic value, has to-day come into wide use in a great number of industries. The consumption in the United States in 1911, according to the United States Geological Survey, was 46,125,000 pounds, the price in New York ranging from 18½ to 22 cents a pound. The Survey has just published a report by W. C. Phalen on "Bauxite and Aluminum," an advance chapter from "Mineral Resources of the United States" for 1911, which gives a comprehensive review of the industry for the year. Bauxite ore, the present source for metallic aluminum, is mined in Arkansas, Georgia, Alabama, and Tennessee, the output from these States combined amounting in 1911 to 155,618 long tons, valued at \$750,649, an increase of about 5 per cent. in both quantity and value compared with the figures for 1910. The increase, though small, shows a healthful condition of the industries dependent on this ore for raw material. (*U. S. Geol. Surv. Press Bull. May 7, 1912.*)

EXPEDITION TO THE EVERGLADES OF FLORIDA. Under the auspices of the Geographical Society of Philadelphia, a botanical and geographical expedition is to be made this summer to southern Florida by Professor John W. Harshberger of the University of Pennsylvania. Professor Harshberger has made two previous trips to Florida and this expedition is to complete his studies in the Everglades region of the southern part of the peninsula. The itinerary will be approximately as follows: Making Ft. Myers near the west coast, headquarters, Prof. Harshberger will first investigate the region in that vicinity; visits will be made to several of the islands along the Gulf Coast; the Caloosahatchee will be ascended by power boat to Lake Okechobee and the flora of that inland lake will be studied. Then the attempt will be made (if the drainage canal has been sufficiently constructed) to cross the Everglades to Ft. Lauderdale on the east coast. As no botanical geographer has ever crossed the Everglades, unusual opportunities will be presented to study a region of great scientific interest. Photographs will be taken of the vegetation, the region will be mapped botanically, and a collection of the more interesting plants will be made. An abstract of the results of this expedition will be published in the October number of the *Bulletin* of the Geographical Society of Philadelphia.

LOWER CRETACEOUS DEPOSITS OF MARYLAND. The Maryland Geographical Survey has just issued Vol. 4 of the series of Reports dealing with the systematic geology and paleontology of Maryland (622 pp. Maps, ills.). The preceding volumes dealt with the Tertiary and Quarternary deposits and the remains of animal and plant life which they contain. The present volume treats of the Lower Cretaceous deposits and their contained life.

IRON ORES OF MARYLAND. The Maryland Geological Survey has published a "Report on the Iron Ores of Maryland," with an account of the Iron Industry by Joseph T. Singewald, Jr. (Vol. 9, 1911, Part 3, pp. 123-327. Maps, ills.). The history of the Maryland Iron Industry is traced from the early colonial days when Maryland ranked foremost as an iron producer, through the prosperous period preceding the Civil War to the subsequent rapid decline in prominence due to extraordinary development elsewhere. The localities where iron has been worked or is now known to exist are described and in many instances the ores are analyzed. Nearly 300 such deposits are located on the maps in the Report. The hope is expressed that this Report will attract to the State those seeking other deposits when the richer ones used at present become exhausted.

DEVELOPMENT IN WESTERN CANADA. The Railroad lines of the Grand Trunk Pacific in Western Canada are being extended this spring, it is said, at the rate of ten miles a day and the company soon expects to be adding 120 miles to its trackage every week, the pioneer parties working day and night. A through passenger service between Regina, the capital of Saskatchewan, and Winnipeg will be established in June. Six thousand men are now at work on the construction of the Transcontinental line, in the region of the Rocky Mountains. This company is now opening virgin territory in British Columbia, where hunting opportunities are said to be unexcelled. A fine moose country extends from the region of the northern bend of the Fraser River to the Little Smoke River. Caribou are also plentiful in this district on the higher plateaus and grizzly and black bear are numerous. With the exception of antelope and mush ox, British Columbia has every variety of big game on the continent.

RAPID GROWTH OF A CANADIAN TOWN. The Mayor of Edson, a young town in Alberta, on the Grand Trunk Pacific Railway, has issued this very concise record of the progress of Edson: "Steel arrived, Aug., 1910. Population 15. Incorporated as a village Jan., 1911; population 490. Incorporated as a town Dec., 1911; population 800. Present population March, 1912, 1,253. Present places of business, 67. Value of buildings 1911, \$486,000." The growth of Edson is assisted by the fact that it is the distributing point between the railroad and the Grand Prairie and Peace River Districts to the north.

THE DIABASES OF LAKE NIPIGON. In explaining the traps or diabases in the Nipigon basin, north of the Keweenaw lavas of Lake Superior, as surface flows, Alfred W. G. Wilson ("Geology of the Nipigon Basin, Ontario." Memoir No. 1, Canada Dept. of Mines, Geol. Surv. Branch, 1910, pp. 72-100) returns to the view of Sir William Logan. Ingall and Lawson, however, have not held this view and the latter in 1893 put forward strong evidence in support of the hypothesis that they are laccolithic sills. Some of the traps Wilson acknowledges to be of this origin. For the others, forming hilltop caps, although they show none of the glassy, amygdaloidal, or flow structures of lava flows, Wilson feels that the presence of soils beneath the lavas and the adjustment of the diabase to a pre-dyabase topography with a relief of as much as 300 feet, coupled with various relationships of unconformities and of included boulders, and the absence of laccolithic roof phenomena, warrant his regarding these traps "as the basal residuals of a once very extensive flow or series of flows of a very fluid diabase over the well dissected topography of a previous cycle."

LAWRENCE MARTIN.

SOUTH AMERICA

A NEW CHILEAN HISTORICAL AND GEOGRAPHICAL SOCIETY. A new scientific society was founded in Santiago de Chile on September 21, 1911, under the name of "Sociedad Chilena de Historia & Geografía." The administration of the society is in the hands of a council composed of sixteen members, eight of whom are elected every two years.

Among the councillors are Luis Riso Patrón, the director of the Oficina de Mensura de Tierras, who is also president of the geographical section of the society, and F. W. Ristenpart, professor of astronomy at the University of Chile and director of the astronomical observatory of Santiago. Enrique Matta Vial was elected secretary, Enrique Blanchard Chessi, librarian, and Ramón A. Laval, treasurer.

The society is divided into three sections: History, Geography and Archeology. Each section has its own president and secretary. The society will have its headquarters at the National Library for the present. Its work will be made known by means of a Bulletin which it is desired to exchange with the publications of other scientific institutions. Correspondence should be addressed to the Secretary, Correo Central, Casilla 1672, Santiago de Chile.

ASCENT OF MT. COROPUNA. Prof. Hiram Bingham of Yale, Director of the Yale-Peruvian Expedition in 1911, described in *Harpers Monthly Magazine* for March his ascent of Mt. Coropuna, Peru. This mountain was marked on the older maps of Raimondi as having a height of 6,949 meters; but as near as Prof. Bingham could determine his height with his aneroids, the mountain, however, has an altitude of only 21,525 feet above sea-level. The ascent was comparatively easy. The summit of the mountain is almost flat for an area of nearly an acre. It is oval in shape 100 feet north and south and 175 feet east and west. The summit slopes rather abruptly on the north side, moderately on the west and very gently for some distance to the south and west.

AFRICA

MAPPING TRIPOLITANIA. In a series of letters addressed to the *Rivista Geografica Italiana* (March-April, 1912), Col. E. Caputo says that the work recently undertaken by the Istituto Geografico Militare in the new colony is mainly devoted to the compilation of a basal map of Tripolitania on a scale of 1:100,000. At the same time some of the topographers have been detailed for the preparation of a map in 1:25,000 of the Menscia region. It is intended to issue eventually special large scale maps of the more important districts.

No absolutely authoritative map of this portion of Northern Africa yet exists. The coast has been surveyed by the British Admiralty and four different maps have been published by the Istituto Geografico Militare. All the data available for this compilation consisted of a very small number of astronomical observations, some compass surveys of the routes followed by the more reliable explorers and a few conflicting barometric determinations. Such were the elements used in the "Carta dimostrativa della Tripolitania alla scala di 1:1,500,000," comprising the region north of the 22nd parallel and within meridians 9° and 25° east. Three other maps on a larger scale were prepared in the same manner.

The party sent by the Istituto Geografico Militare is headed by Col. Eugenio Caputo. Prof. Ing. Antonio Loperfido has charge of the geodetic work. Lieut. Giannini and Chief Topographer Alessandrini are to make the necessary astronomical and geodetic observations. Captains Quaglia, Cavallo, Milanese

and Bonatti have been detailed to undertake a preliminary survey. Prof. Loperfido will have to determine the astronomic position of the City of Tripoli as well as a suitable base line to be used in subsequent triangulation. He will also collect the necessary nautical and geometric tidal data for the determination of the true sea level to be used in the computation of altitudes.

The following work is now being carried on by the Italian Survey: determination of latitude and azimuths, precise leveling, determination of the mean coefficient of atmospheric refraction and topographic triangulation to serve for the relief of the Menscia district. Immediately following the completion of this work it is intended to proceed with the measurement of a geodetic base on the borders of the oases of Gurgi and Gargaresh.

The Menscia Survey is in fair progress. It was expected that the original map would be ready for reproduction some time in May. The delay in its preparation is due in part to the wealth of details which the country offers. It also happens occasionally that the topographers are requisitioned by the military commander for work of an urgent nature. Barring such delays the work is said to be proceeding very satisfactorily.

LEON DOMINIAN.

THE GERMAN EAST AFRICA CENTRAL R.R. COMPLETED TO TABORA. On Feb. 25 the first locomotive on this railroad, now building between Daressalam, the capital of German East Africa, and Lake Tanganyika, arrived at Tabora, the chief point on the route between the Indian Ocean and Tanganyika. Tabora was long the central mart of the Arabs, where all trade routes converged from the southern part of Victoria Nyanza, the eastern coast of Tanganyika and the northern shores of Lake Nyasa. The railroad has thus tapped the great trade center of the interior of the Protectorate. It has taken two years to build this 525 miles of the line. The appropriation for the construction of the railroad to Tabora was greater than the sum expended, so that a considerable amount of funds remains to be applied on the further extension of the road. It is probable that trains will be in operation from Daressalam on the Indian Ocean to Lake Tanganyika, 800 miles, early in 1914. This rail route will then be the shortest route from the Belgian Congo through German East Africa to the Indian Ocean. (*Geog. Zeits.*, Vol. 18, 1912, No. 4, p. 225.)

ASCENT OF MT. ELGON. The Austrian Uganda Expedition, led by Mr. R. Kmunke, ascended the extinct volcano Elgon in December last. This famous mountain, about 60 miles N. E. of Victoria Nyanza, was first brought to notice by the British explorer Joseph Thomson, who found on the lower slopes many artificial caves inhabited by natives. Kmunke pitched his camp in the crater at an elevation of 12,529 feet and later ascended Jackson Peak, the southwestern summit, and finally Franz Josef Peak on the north side of the mountain, where Elgon attains its greatest elevation, 14,192 feet.

LE SERVICE GÉOGRAPHIQUE DE MADAGASCAR SUSPENDED. (*Annales de Géographie*, Vol. 21, No. 116, 1912) says that this survey service which has contributed so largely to the mapping of Madagascar, has been virtually suppressed since the close of last year. The survey was established in April, 1896. The discontinuance of this important geographical work, unprecedented in the history of military cartography, is due to the fact that the budget of 1912 contained no provision for its support. The appropriation provided for carrying it on has averaged about \$18,000 a year. With a budget scarcely one-fifth those devoted to the mapping of French Indo-China and French West Africa, the Madagascar Service was surveying and publishing over four sheets

a year in 1:100,000 and had begun the publication of a map in 1:200,000. Its reconnaissance map in 1:500,000 was completed in 1905. The entire work has now been suspended, the offices closed, and staff disbanded. The result is that the only map of the whole of Madagascar (1:500,000) is inadequate for the study and establishment of wagon and rail routes. The service will necessarily be reestablished some day, but there is no telling how much its plant will have deteriorated by that time.

ASIA

STUDYING A VOLCANO IN ERUPTION. The Swiss Geologist, Dr. Arnold Heim, who has been engaged recently in geological field work in Java, ascended the highest mountain of the island, Smeroe (12,057 feet) and reached its summit just as the eruption of Nov. 15, 1911, was beginning. He was accompanied by the Dutch mining engineer, Mr. Van Goghband. They were able to make important observations and to secure photographs which will later be published.

ETHNOLOGICAL EXPLORATIONS. In February, Dr. Herbert Müller of the Anthropological Museum in Berlin started for China to begin ethnological researches in Manchuria and Eastern Mongolia.

EUROPE

EIGHTEENTH MEETING OF GERMAN GEOGRAPHERS. According to the program of the eighteenth "Deutscher Geographentag," held at Innsbruck on May 28, 29 and 30, the papers to be presented were grouped under the following subjects: Exploration; Geography of the Alps: (a) Anthro-geography, (b) Geomorphology; Teaching of Geography; History of Geography.

Under Exploration the following papers were announced: "Report on the Results of the Austro-Italian Exploration of the Adriatic in 1911-1912," by Prof. Brückner; "The Physiographic Results of the German Tendaguru Expedition to East Africa in 1911," by Dr. J. v. Staff; "The Physiography of the Tian Shan in its Relation to Climate and to the Development of Plant Life," by Prof. Merzbacher; "Glacial Studies in the Western Tian Shan," by Prof. Machatschek; "Main Results of the Expedition to German East Africa in 1906-07," by Prof. Fritz Jaeger; "An Oceanographical Cruise on the Atlantic Ocean in 1911," by Dr. A. Merz.

The place of the meeting naturally led to the choice of the Alps as a subject for special consideration. Under this heading the following papers were to be presented: (Anthro-geography) "The Uninhabited Districts of the Eastern Alps," by Prof. N. Krebs; "Historical Development of the Bavarian-Tyrolean Boundary," by Dr. O. Stolz; (Geomorphology) "Contribution to the Geomorphology of the Styrian Marginal Alps," by Prof. J. Sölch; "On the Origin of Alpine Valley Troughs as Illustrated by the Hohe Tauern," by Dr. L. Distel; "On the Unity and the Causes of the Glacial Period in the Alps," by Prof. R. Lepsius; "Tentative Reconstruction of the Inn Glacier," by Dr. R. v. Klebelsberg; "Timber- and Snow-line in the Alps: A Contribution to the Climatology of Alpine Regions," by Prof. V. Paschinger.

To the teaching of geography papers were to be devoted by Prof. R. Sieger on "The Position of Geography in Austrian Secondary Schools [Mittelschulen]," and by Prof. G. A. Lukas on "Colonial Geography in Austrian Higher Schools." In addition, reports were to be made on the work, during 1909-1912, of the Permanent Committee on Geographical Teaching by its chairman, Prof. Heinrich Fischer, and, by Prof. Penck, on the position to be taken by the Geographen-

tag towards the German Committee on the Teaching of Mathematics and Science.

The following papers were to be read dealing with the history of geography: "The Survival of Erastothenean Units of Measure," by Prof. R. v. Scala; "The History of Geography, and Historical Geography," by Prof. S. Günther; "The Transmission to Posterity of Manuscript Maps of Ptolemy," by Prof. Joseph Fischer; "On the Beginnings of the Knowledge of the Compass in Europe," by Dr. A. Hennig.

The usual report of the "Zentralkommission für wissenschaftliche Landeskunde von Deutschland" was also to be presented by Prof. Friedrich Hahn and a resolution submitted to the meeting urging the preparation by the Commission of a physical atlas in which should be represented regions of special geological and climatological interest in Germany.

In connection with the meeting an exhibition was to be given in the Museum Ferdinandeum dealing with the historical geography of the Tyrol. It was to contain old maps of the Tyrol, old plans and views of Innsbruck, globes and surveying instruments which belonged to the Tyrolean surveyors, Peter Anich and Blasius Hueber, and relief maps of parts of the Tyrol.

In addition, excursions were to be made to the regions of geographical interest so readily accessible from Innsbruck. The main excursion under the leadership of Professors Blaas and v. Wieser, to last three days, was to have the southern Tyrol for its field. After a short visit to the basin of Brixen, Bozen was to be used as a center for excursions in the vicinity. These were to include visits to the Eppan moraine and an ascent of the Mendel Pass on the western side of the Adige valley, and, to the northeast of Bozen, a visit to the plateau of the Ritten with its splendid panorama of the Dolomites. Secondary excursions were planned, in the vicinity of Innsbruck, to the new Karwendel Railroad, which affords direct access to the Inn valley from Munich instead of by the detour via Kufstein, to the mouth of the Ötztal, and to the Berg Isel.

The Innsbruck meeting is thus seen to be the equal of its predecessors in the breadth of its conception of our subject and, therein, representative of the German school of geography.

W. L. G. J.

THE OLDEST MAP OF LOMBARDY. According to R. Almagià (*Riv. Geog. Ital.*, March-April, 1912), the oldest printed map of Lombardy hitherto known was that found in the "Raccolta Lafrery" in the Biblioteca de' Bardi at Florence, bearing the date of 1556, although no printer's name appears on it. It seems, however, that an earlier map exists in the so-called "Raccolte Lafrery" owned by the Vittorio Emanuele Library in Rome. This map is printed from a woodcut measuring 53.2 x 39.5 cms, and is bordered by a single straight line on all sides. On the upper left hand the name "LOMBARDIA" is inscribed. The lower left hand corner contains the following inscription: NOVVM. LANGOBA | RDIE. OPVS SVNMA | DILIGENTA (sic). INMPR | ESSIT. VENETIS. LVC | AS ANTONIVS. DE R. | VBERTIS. APDE. PON | TE DIVE. MOISES. CV | M M. GRATIA.

No scale or coordinates are given. The map shows the stretch of land between Milan and the Adriatic sea. Pictures of military exploits of the period and bearing dates ranging between 1494 and 1515 are represented. This leads the writer to assume that the map was printed sometime between 1515 and 1525. The latter date is that of the battle of Pavia, which, he claims, would surely be mentioned on account of its importance.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

The Revolutionary War and the Military Policy of the United States. By Francis Vinton Greene. xxi and 350 pp. Maps, index. Charles Scribner's Sons, New York, 1911. \$2.50. 9 x 6½.

Military campaigns have considerable value for the teaching and study of geography. Their response to topographic features is usually clear and the military movements have much interest in themselves. The book under review will be welcome to geographers as a concise readable description of the Revolutionary campaigns. The copious maps, based on those appearing in Avery's "History of the United States and Its People," add to the value of the book.

The author, however, shows but little grasp of the physiography of the regions in which the armies maneuvered. For example, in describing the campaigns in New Jersey, there is but little description of the Piedmont, Great Valley or glaciated regions upon which Washington for the most part operated, nor the Coastal Plain upon which the British preferred to move. The campaigns themselves are briefly and clearly described. The lack of geographic material is, perhaps, fortunate from a teaching standpoint in that it compels the student to work out his own correlations. One exception to this is the author's graphic description of the Hudson-Champlain Lowland (page 101). Such descriptions of other regions would add to the value of the book for the general reader.

F. V. EMERSON.

SOUTH AMERICA

South America To-Day. A Study of Conditions, Social, Political, and Commercial in Argentina, Uruguay and Brazil. By Georges Clemenceau. xii and 434 pp. Index. G. P. Putnam's Sons, New York, 1911. 8½ x 6.

Salvador of the Twentieth Century. By Percy F. Martin. xvi and 320 pp. Map, ill., index. Longmans, Green & Co., New York, 1911. \$4.20. 8½ x 6.

Clemenceau's book is one to be glad of, though it does not cover South America. It is a bright realistic picture of many aspects of life in several parts of the Argentine Republic and Brazil and at Montevideo. We should be glad of it because it is literature; agreeable, artistic writing; writing that builds up pictures in the mind whether the reader will or no. Clemenceau's views on geography might not be valuable. Some rare comment on wind or a bit of navigation is apt to be a bad shot, but there is almost none of it. Of blemishes, publishers and proofreaders have put in more: Surely Calval (p. 321) is Cabral, only Cabral did not touch Santos, *Perchero* and *upchero*, at pp. 138 and 239 for *puchero*, *Nichterky* (327) for *Nichteroy*, *expects* (212) for *inspects*, *prize* for *price* (216), *vimdas* for *viudas* (268), *learage* for *leafage* (346)—all unworthy of the traditions of English or American publishing. But these are no sample defects, they are almost all of them. What the camera sees, the surface of things in the light, what we would enjoy seeing if we went to a new land and had the entrée everywhere, that is what Clemenceau's easy pen portrays. He wants, he says, to make us wish to go and see, too. He does. He knows no Spanish, he can converse only with those who possess French, French culture is his touchstone, ever at hand; every German or English accomplish-

ment puzzles him: why is it not French? He is royally treated everywhere, is gracious in his recognition of this, but preserves his dignity and has courteous, independent judgments to offer on what his excellent eyes have seen. He knows how to praise American progress unstintedly while recognizing its limitations. He perceives the almost fabulous wealth of the Argentine land and Southern Brazil and yet the present-day life with them is a gamble. Admirably he brings out the strength in each people or its upper classes, the only ones he could converse with. (That everyone speaks French in "Saint Paul," as this book calls São Paulo, is a figure of speech.) His pages on the invigorating air of the Pampas and the exuberant beauty of the Brazilian forest take one across the equator.

Martin's book is a singular contrast to Clemenceau's. Quite as little a scientific geographic study, it goes very much more into facts and figures. Yet it fails utterly to convey the clear impressions that the French statesman has known how to convey in his seemingly less laborious pages. The photographs, nevertheless, do give a good idea of the scenes depicted. Certainly, there are many facts about Salvador here. Financial notions can be gotten out of the whole perhaps easier than geographic ones. It is hard for a reader to get clear concepts here of either places or people. Trade relations and commercial methods, however, are well described.

MARK JEFFERSON.

Trabajos del Cuerpo de Ingenieros. Encargado del levantamiento del Mapa Físico y Político de Venezuela. Appendice a la Memoria del Ministerio de Relaciones Interiores. xxxiii and 486 pp. Maps.* Imprenta Bolívar, Caracas. 1911. 10½ x 7½.

Stimulated by a desire to publish a new physico-political map of Venezuela, as a part of the centennial celebration of Venezuelan Independence, that government (in 1909) authorized the surveys which are embodied in this volume. The time at the disposition of the topographical engineers was too short for the completion of the work by 1911, but a fair beginning has been made and noteworthy results are now at hand. Already about two square degrees, or 21,000 square kilometers, have been triangulated and mapped topographically. The finished tract extends east and west of the well-known port of La Guaira about one degree, includes Valencia and Caracas, and extends inland to Calabozo, latitude 9° south. In addition, the positions of nearly 150 places scattered over 4½° of latitude and 12° of longitude have been determined astronomically. The scale of the completed map is to be 1:1,000,000.

The progress of topographic work in Venezuela again calls our attention to the unequal value of the data on which existing maps of that and neighboring countries are based. The boundary between Venezuela and British Guiana was laid down accurately by a British-Venezuelan Commission according to the terms of the treaty of 1899. From the Salto de Maturaca to the summit of Roraima the boundary has been run by a Brazilian Commission. The great region of the Upper Orinoco, and the Casiquiare-Negro province, is still without any save primitive maps,—those of Cadazzi, Humboldt, Schomburg, and the Spaniards, modified especially as to longitude by the work of international commissions. Poorly mapped though they are, these remote frontiers are better known than some of the regions which they enclose. The great district between the Orinoco and the Guiana frontier is especially unknown and contains natural resources which should be a stimulus to immediate exploration. The present volume is purely statistical and descriptive; the maps are to appear later.

ISAIAH BOWMAN.

AFRICA

The Baganda. An Account of Their Native Customs and Beliefs. By the Rev. John Roscoe. xix and 525 pp. Ills., plans, index. Macmillan & Co., Ltd., London, 1911. \$5. 9 x 6.

The close reading of this valuable work recording with every note of extreme accuracy the life of the men of once bloody Uganda leaves a sense of unsatisfaction. It is only when a turning of the pages once again to find the

* Listed under "Venezuela," *Bull.*, Vol. 43, 1911, p. 876.

source of this feeling discloses the ascription to Professor Frazer that it becomes apparent what is the trouble with the work. It lacks spontaneity in treatment. That, it seems, is the crying evil in present British ethnology; there is a conscious effort to write into accord with the "Golden Bough." We have commented on the same defect in notices of work done in Papua and among the Veddas, yet, above all who put pen to paper, the field ethnologist should remember the classic maxim "nulus addictus in verba jurare." Yet the author of these somewhat arid studies of the Baganda had a most remarkable opportunity and a free hand until he tied his own wrists. He was on the plateau west of the great African lakes before European influence had made itself felt, he was in fact the forerunner of that influence and laid the foundation of a work in which religion has led a savage folk to a satisfactory culture. He reached this interesting people even before the so-called Arab culture had come among them on the slave trails. We do not for a single moment doubt the accuracy of his observation nor the veracity of his record, yet we cannot escape the feeling that every item is carefully planned to fit into some scheme of ethnologic science. The record would have done the Baganda better service if it had ceased to regard them as so much material for the "Golden Bough," and better service would have been done to Professor Frazer's work by an absolutely unconditioned study of this once great African people. Not until we reach the chapter on folklore do we feel free from the trammel. It is very brief, only thirty pages. Mr. Roscoe has preserved fragments of the Brer Rabbit mythos. In Baganda tales the characters are the Leopard and the Hare. We are surprised that no more was discovered or recorded, for the White Fathers have found among the neighboring Basumbwa a complete epos of the rabbit, Nakami ye Ngaraganza, including the tar baby itself, much of which was translated some four years ago in a New York newspaper with most valuable and satisfactory results.

WILLIAM CHURCHILL.

Land and Peoples of the Kasai. Being a narrative of a two years' journey among the cannibals of the equatorial forest and other savage tribes of the southwestern Congo. By M. W. Hilton-Simpson. xx and 356 pp. Ills., map,* index. Constable & Co., Ltd., London, 1911. 16s. 9 x 6½.

Interesting though this work is, we are precluded from admitting it to independent estimate, a natural result of the circumstances under which it came into existence. It is a little unusual; the author has in effect gathered together a running report and to a certain extent a summation of the expedition of another man, an expedition with which he was permitted to associate himself, yet in which he had no particular part assigned. For the scientific results we are obliged to await the publication thereof by Torday, the head of the expedition, when he has had the time to study them out and prepare them in orderly array. The outlines of the geographical discoveries have already been recorded and are readily accessible to students. (*Geogr. Journ.*, Vol. 36, 1910, pp. 26-57.) Mr. Hilton-Simpson provides an essentially popular narrative, a sketch of personal impressions which shall serve as introduction now and later, as supplement and commentary upon Torday's researches.

In its way a good end is satisfactorily served by reason of the fact that the author, a traveler of wide experience already, was introduced under such excellent leading into jungle experience, his former travels having been most largely prosecuted in desert and arid lands. Above all exploration the threading of jungle calls for the unjaded eye. We recall the sense of being smothered under leafy blankets, of being parboiled in hot steam, of being shut in by giant boles of trees and serried walls of bamboos and other giant grasses, as the persisting character of work in the almost carboniferous tangles of the equatorial regions. Above all recollections is the feeling of narrowness, never a wide prospect to stir geographical zeal, nothing more accomplished and nothing more accomplishable than threading narrow tapes of knowledge through the unknown. It is only the newcomer who can report the jungle life before its grip has caught him in repression. This it is which gives Mr. Hilton-Simpson's narrative its undoubted charm. He has seen and not yet has he become jaded by the tangle of things to see.

* Copy of this map listed under "Belgian Congo" in *Bull.*, Vol. 42, 1910, p. 874.

The terrain covered by this reconnaissance lies midway between the Congo mouth and Tanganyika, the greatest attention having been devoted to the Sankuru affluent of the Kasai from Basongo at the point of union as far as Batempa at a point a few miles higher up the stream than Lusambo. Leaving the Sankuru at Bena Dibebe, the expedition penetrated the forest to Kole on the Lukenie and followed that stream for some distance to Lodja. The Lukenie parallels the Sankuru and Kasai at some little interval to the north; finally it joins the Kasai system just before reaching the Congo. From Lodja a journey northward to Lokesu and beyond brought the party into yet another system, that of the Chuapa, which reaches the Congo at Equatorville. The story of the incidents of the march is well told, the author has observed with interested eyes the life of savage folk never before seen, he has succeeded most happily in presenting a pleasant record.

WILLIAM CHURCHILL.

The Great Plateau of Northern Rhodesia. Being Some Impression of the Tanganyika Plateau. By Cullen Gouldsbury and Hubert Sheane. xxiii and 360 pp. Map, ills., index. Longmans, Green & Co., New York, 1911. \$4.50. 9½ x 6.

On this plateau, 4,000 to 6,000 feet above sea level, lying between 8° and 12° S. Lat., and 30° and 34° E. Long., live a number of tribes that have maintained their distinctive characteristics. This book has for its aim to depict the conditions of the country, and the manners and customs of the people, while they are still primitive—"before they fade and are forever obliterated by the corrosive contact of civilization." The discussion opens with the rites and customs of succession practiced by the most virile of the tribes, the aristocracy of the country, the followers of the Crocodile Kings, and then describes the native customs, especially in relation to justice, the formal festivals of birth, initiation, marriage and burial, and the social life of the villages.

Closely related to the main theme are discussions of the missionary movement in the district and of the future prospects of the territory. In the former, a well-balanced view of the status and work of the missionaries is presented, and the authors have moved safely along the middle road between carping criticism and over-zealous praise. Here, unlike many other places in Africa, Mohammedanism has not become the foe of the Christian missions, mostly because of the inaccessibility of the stations; but as time goes on, the encroachment of the religion of the North, which appeals curiously to the African native, will surely occur and the field of the struggle between Mohammedanism and Christianity will be enlarged.

In the final chapter, the authors summarize their views as to the possibilities of this distant land when it is made accessible by railroads. After this achievement, capitalists may be able to make the Nyassa-Tanganyika plateau a much valued corner of the Empire.

ROBERT M. BROWN.

The Geology and Geography of Northern Nigeria. By J. D. Falconer. xiv and 295 pp. Maps,* ills., index. Macmillan & Co., Ltd., London, 1911. \$3.25. 9 x 5½.

These results of Dr. Falconer's work, while in charge of the Mineral Survey of Northern Nigeria, may well be considered as the nucleus of an eventually more detailed investigation of the Protectorate. Although the title implies that part of the book treats of the geography of the region, the chapter on which this designation is based deals solely with the surface forms and the hydrography of the district. In the main, the author has presented his subject in the form usually adopted by geologists. The minuteness with which he and his collaborators describe the topography of the region evinces both their painstaking care and an ample realization of the extreme importance of familiarity with surface conditions as a preliminary aid to subsequent geologic research. So many workers overlook this that its consideration still deserves a special mention of praise.

The same care appears to have been devoted to the microscopic determination of the crystalline rocks, the texture and structure of which are discussed in

* Listed under "Northern Nigeria," *Bull.*, Vol. 44, No. 4, April, 1912, p.317.

the second chapter. The value of the data collected by Dr. Falconer is readily understood when it is recalled that the districts he has visited belong to a zone of transition between the fully developed deserts of Northern Africa and the well-watered regions of the equator.

The stratigraphic notes forming the bulk of the book's material will doubtless be used to advantage in the eventual solution of the problems in the stratigraphy of this hitherto ill-known region. The author and his collaborators deserve due credit for the attempt made to correlate the evidences of Tertiary disturbances in Northern Nigeria with the far-reaching phenomena now known to have taken place farther north at the same period. At the same time the sequence of events in the course of the Tertiary eruptions is not taken up with sufficient detail. The mere hinting at the limits of petrographic provinces is premature at this stage of our knowledge of the erstwhile igneous activity prevailing in that region. We cannot refrain from noting that practically no reference is made to the work of American geologists in the Great Basin region where the manifestations of Tertiary vulcanism have been studied in detail.

Under the caption of Appendix 1 some very meager notes of the mineral resources of the Protectorate are crowded into some six pages of large type text. This is regrettable. In the first place, because data of economic value have nowadays become the great stimuli of scientific research. Secondly, because of the high value of mineralogic types in the determination of metalliferous provinces where the presence of either a single mineral or of a group of minerals often furnishes the key to the solution of many an important regional problem. The two-fold impressions gathered from the text of Dr. Falconer's work is that, while the region gives evidence of its being economically important if attention is bestowed upon the geologic data given, yet, on the other hand, such is not the case were one to base himself on the paucity of material used in the compilation of the report on mineral resources.

A second appendix is devoted to the enumeration of Upper Cretaceous fossils found, carefully prepared photographic reductions of which are used as illustrations. Considering the work as a whole, it may be asserted that too much praise cannot be given to the author and his collaborators for the splendid pioneer work they have presented in this volume.

LEON DOMINIAN.

ASIA

Atlas zur Geschichte der Kartographie der Japanischen Inseln,

nebst dem Holländischen Journal der Reise Mathys Quasts und A. J. Tasman's zur Entdeckung der Goldinseln im Osten von Japan i. d. J. 1639 und dessen Deutscher Übersetzung. By Paul Graf Teleki. XII and 184 pp. Numerous maps in text with twenty full-page map reproductions. Budapest, 1909.

The author includes under the term "Japanische Inseln" all those which now constitute the Empire of Japan. His work, as stated above, embraces, not only the history of the cartography of this region, with numerous reproductions of early maps, but the accounts of the journeys of Quast and Vries in the year 1639 and 1643, which accounts occupy about one-half of the entire atlas. Though the author confesses to a want of knowledge of the Japanese, Chinese, Spanish, and Portuguese languages, he has given us a remarkably fine piece of work which, he expresses the hope, will encourage others to make further research in the same field. *Part I* treats especially of "Zipangu," first knowledge of which, in Europe during the Middle Ages, appears to have been derived from Marco Polo. That knowledge, however, is shown to have been very inexact in a chapter treating of the cartographical representations of the island before the discovery of America. Its first representation appears in the Catalan map of 1375, based upon the word of the great Asiatic traveler. Though not bearing the name Zipangu, a legend on this map tells of the existence of rich islands in that locality. On the Fra Mauro Map of 1459, it appears under the name "Ziripagi," and it is likewise represented on the Behaim and the Leon globes, as well as on the Toscanelli map, assuming, as does the author, that there was a Toscanelli map, which assumption is probably contrary to fact. An interesting chapter treats of the influence of the discovery of America on the knowledge of Japan and its cartographical representation, at the time of which discovery

the information possessed still rested on the word of Marco Polo. In the efforts to determine the relation of the East Asiatic coast to the West coast of America, Japan is represented now nearer one coast, now nearer the other, being moved about in the Pacific much as were the fabulous islands of an earlier day in the Atlantic, until the visit of the Portuguese near the middle of the sixteenth century.

Sixty-eight maps are referred to and described between 1502 and 1550, in which there is representation of the island, but the confusion of cartographers is particularly noted, beginning in the second half of this period. With some of these cartographers, it was laid down as a part of Asia, with others it was identified as one of the West India Islands.

Part II opens with a consideration of the discovery of Japan by the Portuguese in the year 1542, and of the accounts of their discovery and subsequent relations with the Island as given by Galvano and the Jesuit missionaries who accompanied and followed Francis Xavier. Among the new maps of the region which are of Portuguese origin the author gives full description and explanation of such important publications as are those of Diego Homen of the years 1558, 1561, 1568, of Vaz Dourando, of Lazaro Luiz, and of Henricus a Langren, whose map appears in the *Itinerario* and *Reys-Geschrift* of Linschoten. In this last named work we find an account, fully analyzed by Graf Teleki, of the transplanting of Portuguese knowledge to Holland, Portugal failing to keep in control her attempted trade monopoly with Japan.

In the closing years of the Sixteenth Century, the Netherlands became the center, not only of great commercial enterprises embracing within their scope the regions of the Far East, but also the great center of the reform movements in map-making. The author refers to the work of Mercator, Ortelius, Jode, Hondius and Langren, with special reference to their representations of the regions here in question. In that part of his work in which Graf Teleki calls attention to the journeys of Quast and Vries, he gives the original record with a parallel German translation. In his concluding chapters we find adequate treatment of the discoveries of the Russians and of their contribution to the geographic knowledge of Japan, with a record of the gradual acquaintance with the other islands of the empire to north and south, embracing Formosa and the Kuriles. To his work twenty full pages of splendid map reproductions are added, covering the period from 1492 to 1811, and a valuable bibliography. Graf Teleki's atlas is one of superior excellence, a model for those who have in contemplation a history of the cartography of any other single country.

E. L. STEVENSON.

A Journey in Southern Siberia. The Mongols, Their Religion and Their Myths. By Jeremiah Curtin. xiv and 319 pp. Maps, ill., indexes. Little, Brown & Co., Boston. 1909. 3.9 x 6.

Without being in any sense a philologist, the late Jeremiah Curtin was a facile linguist. His acquaintance with sixty languages is somewhat of a marvel to those who do not know how easy a new language is of acquisition by such as have passed their tenth language. This record of sixty languages means no more than that Mr. Curtin was equipped with a supply of tools beyond the provision which most literary men have. A tool-chest can be valued only by the product exhibiting the use made of its equipment. Frequently the polyglot student collects new languages much as a squirrel collects nuts; Mezzofanti, for a lucid instance of the case in point, is best remembered for his knowledge of fifty languages, yet his literary remains are comprised in but a single item, and that stupid.

Curtin is best recalled as the translator of Sienkiewicz, a service now by no means so highly esteemed as when that Pole was a literary fashion. This little volume is of far more worth, for in it we have the results of Curtin's utilization of one of the obscure languages of his acquisition, that of the Buriat, the little-known Mongols of Lake Baikal, on three sides of which and on its only island, Olkhon, they are now settled. The results are so valuable, the record is so intimate, as to move to great regret that Mr. Curtin did not more employ his linguistic equipment for independent product.

The Buriat have received Russian study ere this, but it has altogether been

such study as would suggest itself to the political administrator dealing with an inferior civilization and the government problems which it offers. This is the first general study of the drones of the Mongol race who were stay-at-homes in the great era when their kind swept along to the conquest of Asia and to the delivery of a threat which caused Europe to quail. Supported by a most considerable mass of newly collected legend, this posthumous narrative will long stand as the standard ethnographic authority upon this interesting folk.

W. C.

Palestine. Depicted and Described by G. E. Franklin. xx and 219 pp. Map, illus. J. M. Dent & Sons, Ltd., London. 1911. 10s. 6d. 9 x 6.

For any work upon this theme and of this general character the standard of comparison must long remain Thomson's "The Land and the Book." That was a work of the best scholarship of its day, of the utmost reverence in the treatment of holy scenes. It is one of the classics of literature. In the half century which has elapsed, Palestine has been far more disclosed. Our knowledge is based upon the accurate determinations conducted by the Palestine Exploration Fund. The result appears in this volume; many things that in Thomson's time were uncertain have now been made clear, many things then unknown have come to light, the accuracy of photography affords us truer pictures than the most reverent pencil, and this work, if for nothing other, is welcome by reason of its 376 views of spots famous in sacred history.

From the essential conditions of its theme any work on Palestine must be far more than a guidebook to the traveler or a handbook for the reader. It cannot help being a commentary on Scripture. Mr. Franklin has preserved a safe path through intricacies over which many theological battles have been fought, a task of peculiar difficulty for the geographer of the Holy Land, since even so simple a matter as place determination not infrequently engages with basic matters of several confessions of faith. In minor matters the author might have shown himself to better advantage as tolerant of error made by earlier travelers. The careful historian will not always dismiss quite so cavalierly the consensus of ancient tradition. Despite these minor blemishes, the volume should be an interesting companion for such as make the pilgrimage to Palestine and it will certainly prove of value in the library equipment of evangelical pastors.

WILLIAM CHURCHILL.

EUROPE

Turkey and Its People. By Sir Edwin Pears. vi and 409 pp. Index. George H. Doran Co., New York, 1912. \$3.50. 8½ x 5½.

None of Sir Edwin Pears's works could, perhaps, better reveal the great value of his Oriental researches to English-speaking students than this accurate description of the heterogeneous components making up the Ottoman population. Those of us who have had the advantage of listening to his lectures in Robert College well remember how we marveled at the thoroughness of his knowledge of matters pertaining to the East. The same impression is felt on reading his book. This is not a mere traveler's tale. Rather, the sum total of almost half a century's experience is set forth in these 400 pages. The writer has known, often intimately, a great many representatives of every race in Turkey. He has learned almost to become a Turk when in the company of Turks, or an Armenian when with Armenians, and generally to adapt himself to the environment conditioning the lives of the inhabitants of his place of residence.

It is particularly in describing the Greeks of the Turkish Empire that Sir Edwin is abundantly equipped. His descriptions bring to light the Greek type as evolved from the Byzantine. The transformation the race has undergone under the influence of its Turkish masters is also well shown. His reference to Greek communities which, while preserving their religion, have lost their own language and speak nothing but Turkish, is an excellent example of the influence one race may exert on another even though they have no social intercourse within the same city walls. In this case, religion has been the only barrier to complete fusion with the Mohammedan element. Sir Edwin's remarks on the Greek Church in this respect are pertinent. His exhaustive study

of this subject has enabled him to detect certain traces of paganism in the Eastern churches. His notes relating to this matter will interest students of Byzantine times and also constitute a good example of the latent force of former associations that influence later generations.

The description of the dwellers of Asia Minor is prefaced by an accurate review of the physical conformation of the peninsula. The isolated communities and the nomad races thus stand out partly as products of geographical factors. It is interesting to note how fundamental traits due to the envioning physiography are often far more striking than the recognized differences of race or religion into which human types are more commonly classified.

The chapter on the development of Islam contains very timely comment on the gradual infusion of a strain of western reasoning into the Mohammedan mind. In the broad belt extending from the westernmost shores of Africa as far east as the Philippine Islands, the tenets of the Koran are being reviewed and interpreted in the light of more advanced conceptions. The influence of this evolution of the Sherryat on Turkish judicial procedure could not have escaped the attention of so eminent a jurist as the author is known to be. His very valuable commentary on the Capitulations and the standing of foreign communities is the result of 40 years of careful deliberation. No other lawyer, perhaps, can boast of so wide an experience.

The book concludes with a chapter entitled "Signs of Improvement in Turkey." This is a résumé of the general progress accomplished in the country from 1820 to our day. The dominant note of this chapter is the fact that civilization has made enormous strides throughout the land notwithstanding long periods of misgovernment under despotic rule. LEON DOMINIAN.

POLAR

In Northern Mists. Arctic Exploration in Early Times. By Fridtjof Nansen.

Translated by Arthur G. Chater. Vol. 1, xviii and 384 pp. Vol. 2, xiii and 420 pp. Index. Maps, and ills. in each. F. A. Stokes Co., New York, 1911. \$8. 10 x 8

There is a wealth of material in these two stately volumes which will fairly astonish those to whom the name of Nansen suggests little south of the great circumpolar ice. The purpose of the work is to set forth the slow stages by which our culture, a narrowly restricted product of the Mediterranean, first discovered and in the end occupied the northern lands of Europe and thence was led onward to the discovery of the unknown world over the sea of receding terror.

We know of no authority who has made such a careful study of Pytheas, that merchant adventurer out of Massilia, who was the discoverer of the true extent of the British Isles and who passed beyond Scotland and the Orkneys to some Thule beyond. Dr. Nansen has reinstated him, has done more, has set him in the position of the first geographer of northern Europe. Another authority whom time has flouted is in the same careful analysis restored to grace, that Ottar or Othere whom King Alfred believed. It is something accomplished to have cleared away the neglect under which these two early voyagers have been buried.

We judge that on this side of the Atlantic the greater interest of this work will lie in Dr. Nansen's treatise on the Norse discovery of America. This theme has been polemic and battle has fiercely raged about its every detail, battle not always fairly waged. We observe that the author treats with a neglect that cannot be unstudied the proposed runes of the Dighton Rock, as well as the skeleton in armor and the Newport mill; the more recent runic stone of Minnesota he denounces as modern forgery.

Leif the Lucky, son of Eric the Red, was long a belief even of Americanists. It could scarcely be denied in safety that he discovered Wineland the Good. The only point as to which debate was permissible was the setting of Wineland upon the maps. It was possible to maintain that Wineland was Newfoundland, it was possible to identify it in Nova Scotia, on the coast of Maine, even as far south as Cape Cod and Narragansett Bay. Somewhere there is a statue to this hardy voyager. Norumbega yet remains a name.

In those days of conflict it was expected of every Scandinavian that Leif the

Lucky should be an article of the most devout faith, even the stoutest of American opponents was willing to concede the voyage of Leif's long ship, the only disagreement was upon the precise goal in America which he reached. But Dr. Nansen, so proud of the history of his great forefathers that he will tolerate not the slightest taint of fiction to draw from their proper credit, destroys the discovery of Wineland with consummate analysis of saga and other legend. After his study we need no longer concern ourselves with debate as to Leif Ericson's landfall. It was nowhere on the American main, Wineland the Good is nowhere on this earth. It is the port of Cloudecuckooland, it is filmy myth. The argument to this destruction of Wineland is slowly elaborated in these volumes. Not an item in the saga account is neglected, each least particular in the narrative is carried back to its source in the mass of folk mythology and it is shown how each such item came into the possession of the northern makers of sagas. It is a powerful case of analysis. Not a wisp of Wineland is left to perplex our northeastern geography. Even the wild men of Wineland have had to go, the Skraelings; we shall miss the Skraelings. There was something attractive about those superhuman savages, something that made the flesh creep even to read of them, all tending to set in higher glory this Leif the Lucky.

WILLIAM CHURCHILL.

GENERAL

Meteorology. A Text-Book on the Weather, the Causes of its Changes, and Weather Forecasting for the Student and General Reader. By Willis Isbister Milham. xvi and 549 pp. Maps, ills., index. The Macmillan Co., New York, 1912. \$4.50. 9 x 6.

We have here the results of Professor Milham's experience in teaching during the past eight years at Williams College, supplemented by study at the Weather Bureau in Washington, where he went to familiarize himself with the Government meteorological work. This combination of college teaching and of a knowledge of practical meteorological work has resulted, as might easily have been predicted in the case of the author of this book, in the production of an excellent text, well-arranged, up to date, and very strong on the bibliographic side.

There has been increasing need of a text-book of meteorology which should present the most recent developments of the science, and which should, at the same time, give the reader and student a well-selected list of references to the literature, which has been growing with such rapidity that even most experts can no longer hope to keep up with it. Professor W. M. Davis's "Elementary Meteorology" is now fifteen years old, and is already behind the times in several respects, although it has not lost the commanding position which it has held by reason of the remarkable clearness of its presentation, the logical development of its treatment, and the emphasis which it lays upon the correlation of the different meteorological phenomena. Its importance is clearly shown by the fact that Professor Milham is much indebted to it in his own work. Those who know the "Elementary Meteorology" well will recognize the points of similarity. We say this without meaning in any way to detract from the importance of Professor Milham's own book. To our mind, no writer of a text-book of meteorology, intended for purposes of instruction, would do well to attempt to cut himself entirely loose from the general plan marked out by Professor Davis.

Professor Milham has given us exactly what we have been needing for years past, and we commend his Meteorology to the "general reader" and to the teacher and student. Systematically arranged, with summaries at the beginning of each chapter, marginal headings, questions, topics for investigation and bibliographies, the present status of the science is clearly summarized and the reader is guided to such further study as he may have the opportunity to make. Those who have themselves endeavored to keep up with the recent advances in meteorology will appreciate the wide range of Professor Milham's reading. His text is unusually complete; in fact, the body of the material is so solid that in some places it might almost seem to be almost too solid. But the

mistake, if there be a mistake, is surely on the right side. A solid text is far better than a slim one, in such a book. Probably few of his readers will find it necessary to go beyond his text for the information which they are seeking. And this is a distinct advantage in the case of a text-book which we hope, and believe, will have extended use among teachers.

Professor Milham's desire to present the current views of meteorologists leads him in some cases to outline several theories (as, *e. g.*, in the case of the theories of extra-tropical cyclones). He gives the arguments *pro* and *con* very clearly and succinctly, but the student may perhaps wish that something more definite had been given him. Most students of elementary science do not like to argue things out for themselves. What they want is a definite statement which they may take as authoritative. This is not a very encouraging frame of mind, but it is very common. Again, in a few cases, our author does not seem to us to have given, with sufficient clearness, the generally recognized explanation of the phenomenon which he is discussing, *e. g.*, in connection with the relation between isobaric surfaces and isobaric lines, the diurnal variation in wind direction, and the formation of the tornado funnel cloud. Yet we have no hesitation in saying that Professor Milham has, on the whole, avoided giving too great detail on the one hand, and too incomplete an outline on the other. The discussion of the deflective effect of the earth's rotation and of its application to the circumpolar whirl, and of the general circulation (surface and upper), will perhaps strike others besides the reviewer as being among the less effective portions of the text, while the sections on weather prediction are admirably done. There is an excellent, clear, and complete account of weather forecasting, which will be found extremely useful. A generous supply of charts, including several carefully selected illustrative weather maps, adds greatly to the value of the book. A few of the illustrations are not always as clear as could be wished, as, for example, the figure of a thunderstorm (p. 324), of the distribution of the meteorological elements around tropical and extra-tropical cyclones, and around anticyclones (pp. 268, 284, 295).

The volume itself is a singularly clear and effective presentation of the present status of meteorological science, in a form which renders it extremely useful for teaching. We feel sure that Professor Milham has given us a text which will contribute greatly to the advance of meteorological knowledge in this country.

R. DEC. WARD.

The Effect of Topography and Isostatic Compensation upon the Intensity of Gravity.

By John F. Hayford and William Bowie. Special Publication No. 10, Coast and Geodetic Survey, 1912. 132 pp. Maps, illus., index. 11½ x 9.

The introduction of isostasy in the determination of the figure and size of the earth from observed deflections of the vertical resulted in a marked increase in the accuracy of the values deduced. It was logical that isostasy should be considered in the reduction of gravity observations in order that a corresponding increase in accuracy of the shape of the earth might be obtained from these data.

A preliminary report on the reduction of fifty-six gravity stations in the United States, by the new method, was made to the International Geodetic Association at London and Cambridge in 1909 by Hayford. The present publication is a complete report on the reduction of eighty-nine gravity stations in the United States.

By the new method a correction is applied at each station for the attraction of the topography of the whole earth and also a correction for the isostatic compensation of the topography in addition to the correction for the height of the station above sea-level. The compensation is assumed to be complete and uniformly distributed from the surface to a depth of 113.7 kilometers. This was the most probable limiting depth as determined by the first investigation of the figure of the earth and isostasy from measurements in the United States. The better value of 120 kilometers, obtained from the second investigation of the figure of the earth and isostasy, was not available at the time the tables were computed for the gravity reductions.

The methods used in applying the effect of the topography and its compensation are fully described and the necessary working tables are given. In

fact, all the data are given that are necessary for making reductions at any gravity station in the world.

The procedure at each of the gravity stations was to compute the theoretical gravity for the latitude of the station in question by the Helmert formula, correct this for the elevation of the station above sea level and then apply the correction for the topography of the world and its compensation. The resulting theoretical value is then compared with the actually observed value of gravity at the station. The difference between the computed and observed values is the anomaly which indicates a departure at that station from the assumed density of the earth's surface and of the computed excesses and defects of density in the crust to the depth of compensation.

A comparison is made of the new method anomalies in size and sign, with the anomalies given by the free air and Bouguer methods and the result is in practically every case in favor of the new method.

The eighty-nine stations in the United States were arranged in groups with reference to their relation to topography. The groups are: 16 coast stations; 18 stations near the coast (within 325 kilometers); 27 continental stations not in mountainous regions; 16 stations in mountainous regions, below the general level; and 12 stations in mountainous regions, above the general level. The mean without regard to sign of the anomalies at eighty-seven stations (two stations not considered) is .017 dyne or centimeter. For the five groups mentioned above the corresponding means are .017, .020, .018, .012, and .014 dyne, of which no one is much above the general mean of all.

The means with regard to sign for the five groups are: $-.004$, $+.002$, $+.002$, $-.002$, and $+.003$ dyne. The general conclusion from the examination is that the anomalies by the new method show no relation to the topography either in sign or average magnitude. It is shown on the other hand that there are decided relations between the anomalies by the two older methods of reduction and topography.

It was found that there appears to be a relation between the surface geologic formation and the size and sign of the new method anomalies. The mean of the anomalies at seven stations on Pre-Cambrian formation is $+.019$ dyne, with regard to sign, and .026 dyne, without regard to sign. This indicates an excess of material in the crust in the vicinity of these stations. The means with and without regard to sign of the anomalies at 20 stations in the Cenozoic are $-.011$ and .021 dyne, respectively. This appears to indicate a deficiency in mass in the crust at these stations. It is shown that these anomalies are probably caused by erroneous assumptions as to the density of the surface materials and also to a departure from a state of complete isostasy.

The mean without regard to sign of the new-method anomalies at the eighty-nine stations in the United States is only 0.017 dyne. An anomaly of $+.017$ dyne would be produced by an excess of mass corresponding in amount to a stratum about 570 feet thick of density 2.67 (the mean surface density of the earth) with the station at the center of one surface of the disk and the disk of indefinite extent. An anomaly of $-.017$ dyne would be produced similarly by a deficiency of mass corresponding to a stratum about 570 feet thick. The gravity observations indicate, therefore, that the isostatic compensation is everywhere so nearly complete that the excesses and deficiencies of mass above the limiting depth of compensation correspond upon an average to a stratum only 570 feet thick. The average elevation of the surface of the ground in the United States is about 2,500 feet, more than four times 570 feet.

The evidence furnished by the new method gravity anomalies in regard to the location and extent of the continuous areas of excess or deficiency of mass in the United States, that is, of under-compensation or of over-compensation, confirms and supplements that given by the observed deflections of the vertical previously considered and published by the Coast and Geodetic Survey in the second publication on the Figure of the Earth and Isostasy. (Written by W. Bowie and reprinted from the *Journal of the Washington Academy of Science*, April 4, 1912.)

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

SOME GEOLOGICAL RAMBLES NEAR VASSAR COLLEGE. By George Burbank Shattuck. 108 pp. Map, ills. The Vassar College Press, Poughkeepsie, 1907. $6\frac{1}{2} \times 4\frac{1}{2}$. [An admirable little book with a photograph on every other page opposite a page of explanatory text; a map on which each location is noted and text-book references at the bottom of each page of text. Many geological phenomena between Rhinebeck and Fishkill on both sides of the Hudson and as far away as Lake Mohonk are thus illustrated and explained. Dr. Shattuck is Professor of Geology in Vassar College.]

GEOLOGY OF THE CITY OF NEW YORK. By L. P. Gratacap. Third edition, enlarged. x and 232 pp. Maps, ills. Henry Holt & Co., New York, 1909. \$2.50. $8\frac{1}{2} \times 6$.

DER NEGER IN DEN VEREINIGTEN STAATEN VON NORDAMERIKA. Von Moritz Schanz. 133 pp. Index. G. D. Baedeker, Essen, 1911. Mk. 1.20. 9×6 .

PEEPS AT MANY LANDS. CANADA. By J. T. Bealby. vii and 88 pp. Map, ills. The Macmillan Co., New York, 1911. 55 cents. $8 \times 5\frac{1}{2}$.

CENTRAL AND SOUTH AMERICA

MISSION DANS L'AMÉRIQUE CENTRALE 1909-1910. Par Maurice de Périgny. (Extrait des Nouvelles Archives des Missions scientifiques, nouv. série, fasc. 4.) 16 pp. Map, ills. Imprimerie Nationale, Paris, 1911. $10 \times 6\frac{1}{2}$. [A description of the ruins of Mactun, attributed by M. de Périgny to the early period of Maya civilization.]

IN THE AMAZON JUNGLE. Adventures in Remote Parts of the Upper Amazon River, including a Sojourn among Cannibal Indians. By Algot Lange. Edited in part by J. Odell Hauser, with an introduction by Frederick S. Dellenbaugh. xx and 405 pp. Map, ills., index. G. P. Putnam's Sons, New York, 1912. \$2.50. 9×6 . [Especially noteworthy for many fine photo-engravings.]

VIAJES DE EXPLORACION I ESTUDIO EN LA PATAGONIA OCCIDENTAL. 1892-1902. Por el Dr. Hans Steffen. 2 vols. Tomo Primero, xi and 409 pp., illustrations, maps and index. Tomo Segundo, viii and 549 pp., illustrations, maps and index. Imprenta Cervantes, Santiago de Chile, 1910.

IN THE GUIANA FOREST. Studies of Nature in Relation to the Struggle for Life. By James Rodway. New, revised and enlarged edition. 326 pp. ills. A. C. McClurg & Co., Chicago, 1912. $8\frac{1}{2} \times 5\frac{1}{2}$. [This enlarged edition places even more emphasis than the first issue upon the flora and fauna of the great tropical forest. It is a first rate book for students of nature and every page also will interest the general reader.]

AFRICA

L'AFRIQUE NOIRE. Par Capitaine O. Meynier. Bibliothèque de Philosophie scientifique. 335 pp. Map, ills. Ernest Flammarion, Paris, 1911. Fr. 3.50. $7\frac{1}{2} \times 5$. [The title gives no idea of this work. It is a philosophical résumé and discussion of the human influences, native and foreign, in Africa within the historic period, the achievements and failures of these agencies, and the present stage of development.]

PIONEERS IN WEST AFRICA. By Sir Harry Johnston. 336 pp. Maps, ills. Blackie & Son, Ltd., London, 1912. 6s. 8×6 . [A popular account of the leading pioneer explorations, including those of Mungo Park, Denham, Clapperton and the Landers.]

THE OPENING UP OF AFRICA. By Sir H. H. Johnston. Home University Library. 255 pp. 2 sketch maps. Glossary. Williams & Norgate, London, 1911. 1s. $6\frac{1}{2} \times 4$. [Gives the outlines of the history of Africa as far as it relates to the occupation and development of the continent or parts of it by various peoples and nations. A good, condensed narrative.]

ON HORSEBACK THROUGH NIGERIA, or Life and Travel in the Central Sudan. By J. D. Falconer. 312 pp. Map, ills., appendix, index. Charles Scribner's Sons, New York, 1911. 9×6 .

ASIA

JOHANN GEORG GMELIN 1709-1755. *Der Erforscher Sibiriens. Ein Gedenkbuch.* 146 pp. Ill. Verlag Otto Gmelin, München, 1911. Mk. 7.50. $9\frac{1}{2} \times 7\frac{1}{2}$. [This volume, issued just 200 years after the birth of Gmelin, commemorates the great work he did during his explorations in Siberia between 1733 and 1743. A botanist, his study of the flora of that region was of special value and the additions he made to knowledge of the geography of Siberia were also very important.]

SVEN HEDINS ANTEIL AN DER ERFORSCHUNG ZENTRALASIENS. Von Max Rieger. 116 pp. Map. J. P. Bachem, Köln, 1911. Mk. 1.80. $9\frac{1}{2} \times 6$. [An excellent summary of Dr. Sven Hedin's explorations in Central Asia.]

EINFÜHRUNG IN DIE TROPENWELT. Erlebnisse, Beobachtungen und Betrachtungen eines Naturforschers auf Ceylon. Dr. Konrad Günther. x and 392 pp. Map, ill., index. Wilhelm Engelmann, Leipzig, 1911. Mk. 4.80. 8×5 . [A well-arranged, geographical treatment of Ceylon, with special emphasis on flora and fauna.]

JOURNAAL DER REIS VAN DEN GEZANT DER O. I. COMPAGNIE JOAN CUNAUEUS NAAR PERZIË IN 1651-1652. Gehouden door Cornelis Speelman. Uitgegeven door A. Hotz. cxv and 466 pp. Map, ill., index. Werken uitgegeven door het Historisch Genootschap, Derde Serie, No. 26. Johannes Müller, Amsterdam, 1908. Fl. 6.50. 9×6 . [The journey described in great detail in this volume, was from Bender-Abbas at the south end of the Persian Gulf, N. W. to Ispahan, about 500 miles.]

ZIONIST WORK IN PALESTINE. By Various Authorities. With a Foreword by David Wolffsohn. Edited by Israel Cohen. 208 pp. Ills., appendix. Zionist Central Office, London, 1911. 1s. $7\frac{1}{2} \times 5$. [A compendium of information on Zionist work in Palestine, the first in English.]

EUROPE

THE NAVIGABLE RHINE. The Development of Its Shipping, the Basis of the Prosperity of Its Commerce and Its Traffic in 1907. By Edwin J. Clapp. Map, ill., index. Houghton Mifflin Co., New York, 1911. \$1. $8\frac{1}{2} \times 5\frac{1}{2}$. [The author is Asst. Professor of Trade and Transportation at the School of Commerce in this City. All who are interested in commercial and economic topics will welcome this admirable work, which is marked by orderly arrangement of data, and a clear and interesting manner of telling the story of the great waterway.]

ROME. By W. Warde Fowler. Home University Library. 256 pp. Bibliogr., index. Henry Holt & Co., New York, 1912. 50 cents. 7×5 . [Tells the story in outline of the advance of the Roman power to the leadership of Italy.]

SOMMERTRÄUMEREIEN AM MEERESUFER. [By The Archduke Ludwig Salvator.] viii and 97 pp. Heinr. Mercy Sohn, Prag, 1912. 8×5 .

THE MAKING OF SCOTLAND. Lectures on the War of Independence delivered in the University of Glasgow. By Sir Herbert Maxwell, Bt. xi and 242 pp. Map, plan. James MacLehose & Sons, Glasgow, 1911. $8 \times 5\frac{1}{2}$. [A concise expression of the facts leading to the evolution of the kingdom of Scotland by the consolidation of the petty kingdoms that existed in the Eighth Century, and the later fortunes of the kingdom.]

DAS OSTSEEGBIET. Von Dr. Gustav Braun. Aus Natur und Geisteswelt, 367 Bändchen. 108 pp. Maps. B. G. Teubner, Leipzig, 1912. Mk. 1.25. $7\frac{1}{2} \times 5$.

GENERAL

ANTHROPOLOGY. By R. R. Marett. Home University Library. 256 pp. Bibliogr., index. Henry Holt & Co., New York, 1912. 50 cents. 7×5 . [Ten chapters on the scope of Anthropology, antiquity of man, race, environment, language, social organization, law, religion, morality and man, the individual.]

PREHISTORIC MAN. By W. L. H. Duckworth. Cambridge Manuals of Science and Literature. viii and 156 pp. Ills., index. University Press, Cambridge. G. P. Putnam's Sons, New York. 40 cents. $6\frac{1}{2} \times 5$. [As estimates of the length of geological periods are so various the author distinguishes subdivisions of

time by reference to animal-types with which human remains have been found associated or by the forms of stone implements.]

THE CHANGEFUL EARTH. An Introduction to the Record of the Rocks. By Grenville A. J. Cole. ix and 223 pp. Ills., index. The Macmillan Co., New York, 1911. 50 cents. 7 x 5. [A good, simply written book calculated to stimulate interest in geological study.]

THE NATURAL HISTORY OF CLAY. By Alfred B. Searle. Cambridge Manuals of Science and Literature. viii and 176 pp. Ills., bibliogr., index. G. P. Putnam's Sons, New York, 1912. 40 cents. 6½ x 5.

MANUAL OF NAVIGATION LAWS. An Historical Summary of the Codes of the Maritime Nations. By Edwin M. Bacon. 81 pp. Index. A. C. McClurg & Co., Chicago, 1912. 50 cents. 7 x 4½. [Presents data covering the inception, growth and readjustment of the Navigation Codes of the leading nations and discusses the policies of competing countries in their efforts to build up and protect their merchant marine.]

ANGEWANDTE PHOTOGRAPHIE IN WISSENSCHAFT UND TECHNIK. Herausgegeben von K. W. Wolf-Czapek. In Vier Teilen. xv and 407 pp. Ills., index. Union Deutsche Verlagsgesellschaft Zweigniederlassung, Berlin, 1911. Mk. 4.50. 10 x 7. [An exhaustive treatise on the application of photography in scientific and technical researches.]

VON POL ZU POL. Von Sven Hedin. viii and 312 pp. Maps, ill. F. A. Brockhaus, Leipzig, 1911. 3 M. 8 x 5½. [A travel book by the renowned explorer, written especially for the young, in which he describes not only the regions which were the scene of his explorations but many other lands as well. In fact he takes his readers around the world and includes Australia and some islands of the East Indies.]

LIFE AND LETTERS OF ROBERT EDWARD LEE. Soldier and Man. By Rev. J. William Jones. 486 pp. Portraits. Neale Publishing Co., New York. 1906. \$2. 9 x 6. [A successful effort to depict the life and character of Gen. Lee through his letters and the reminiscences of the author. This portrayal of Gen. Lee as he was, one of the noblest men and greatest soldiers America has produced, has been welcomed by the whole country.]

DESCRIPTIVE CATALOGUES OF MAPS. A paper read before the Bibliographical Society. Nov. 21, 1910. By Sir Herbert George Fordham. 32 pp. Blades, East & Blades, London, 1912. 9 x 7. [Description of engraved maps and reprints of them of Hertfordshire and Cambridgeshire.]

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BARROWS, H. K., AND OTHERS. Delaware R. Drainage Basin. *Water-Supply Paper 261, U. S. Geol. Surv.*, pp. 220-250. 1911.

BARROWS, H. K., AND OTHERS. Hudson River Drainage Basin. *Water-Supply Paper 261, U. S. Geol. Surv.*, pp. 171-215. 1911.

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DALE, T. N., AND H. E. GREGORY. The Granites of Connecticut. 137 pp. Maps, ill., geol. sections, index. *Bull. 484, U. S. Geol. Surv.* 1911.

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GEORGE, R. D. The Main Tungsten Area of Boulder Co., Col. Maps, ill., bibl. *Colo. Geol. Surv.*, 1st Report, 1908, pp. 7-103. Denver, 1909.

GUILLLOT, F. Ressources minérales des États-Unis. Le cuivre, le charbon et le fer. Diagram. *Revue de Géogr. Annuelle*, Vol. 4, 1910, pp. 309-357. Paris.

HENSHAW, H. W., AND C. BIRDSEY. Mammals of Bitterroot Valley, Mont., in Relation to Spotted Fever. 24 pp. Ills. *Circ. No. 82, Bur. Biol. Surv., U. S. Dept. of Agric.* 1911.

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NEW MAPS**EDITED BY THE ASSISTANT EDITOR****System Followed in Listing Maps.**

Title. As on original, if possible. If lacking or incomplete, necessary matter enclosed in brackets.

Scale. Natural (unless otherwise on original). If no scale on original, approximate scale enclosed in brackets.

Coordinates. Approximate limiting coordinates of map given except when region explicitly defined by title. Where map-net lacking, coordinates, if possible of determination, given in brackets. All meridians referred to Greenwich. If map not oriented N., orientation given.

Colors. Number of tints of separate symbols, not number of color printings given. Black or basal color not considered a color.

Source. If map separately published, name of institution issuing it, place and date given. If a supplement, title of paper or book, author, periodical, volume, number, year and pages given.

Comment. Descriptive and critical. In brackets.

Regional Classification. Major political divisions the unit, as a rule, except for United States and Canada. Boundaries of continents according to Siever's *Länderkunde*, Kleine Ausgabe.

NORTH AMERICA

NORTH AMERICA. Sketch Map to illustrate a paper on North American Deserts by Prof. D. T. MacDougal, M.A., Ph.D., LL.D. Compiled by Dr.

Forrest Shreve. 1:15,000,000. 51°-15° S.; 127°-82° W. 1 color. With diagram: Rainfall at the Desert Laboratory, Tucson, Arizona, 1904-1910. Compiled by Mr. Godfrey Sykes. Accompanies "North American Deserts" by D. T. MacDougal, *Geogr. Journ.*, Vol. 39, No. 2, 1912, pp. 105-123.

[A valuable map if viewed with the proviso that it does not show what its title implies and its legend indicates. What is shown is not, as stated in the legend, the extent of the "desert areas," but, as correctly defined in the text (p. 116), that of the arid region of North America. Even so, it is to be regretted that no differentiation is made between true desert and steppe. Conceptual confusion would be avoided by distinguishing such true deserts as the Great Salt Lake, Colorado and Mohave Deserts from the remainder of the arid region as is done on standard vegetational maps of the region, such as that, for instance, in Bartholomew's "Atlas of the World's Commerce" (Plates 50-51). Nevertheless, the map is of great value in its accurate delineation of the outer boundary of the arid region irrespective of its subdivisions.]

SOUTH AMERICA

BRAZIL. Mappa do Estado do Ceará. Ampliação parcial do Mappa (Publicação No. 3, Serie 1, G da I. O. C. S.) levantado sob a direção dos engenheiros Horace E. Williams e Roderic Crandall do Serviço Geológico e Minerológico [sic] do Brasil (Orville A. Derby, Chefe) augmentado com colaboração do Sr. Antonio Bezerra de Menezes. 1:650,000. 2°30'-7°50' S.; 41°20'-37°5' W. 3 colors. Publicação No. 6, Serie 1, G, Inspectoria de Obras contra as Seccas, Ministerio da Viação e Obras Publicas. Oct. 1910.

[Valuable large-scale general map. Relief in brown shading, drainage in blue, railroads and telegraph lines in red.]

BRAZIL. Mappa dos Estados do Ceará, Rio Grande do Norte e Parahyba com parte dos estados limitrophes pelo Serviço Geológico e Minerológico do Brasil (Orville A. Derby, chefe) sob a direção dos engenheiros Horace E. Williams e Roderic Crandall.... 1:1,000,000. 2°30'-8°0' S.; 42°0'-34°30' W. 4 colors. Publicação No. 3, Serie 1, G, Inspectoria de Obras contra as Seccas, Ministerio da Viação e Obras Publicas. Oct. 1910.

[The map has an index diagram on its margin showing how it fits into the scheme of the International Map of the World. It embraces the whole of sheet B 24 and the land portion of sheets A 24 and B 25 and, as a part of the millionth map, bears the title Mossoró with the names of the adjoining sheets of which it comprises portions as subtitles. Relief is in brown shading, drainage in blue, roads in red. Ceará is reduced from the map of that state listed above.]

BRAZIL. [Three adjoining sheets of the topographic map of the state of São Paulo.] 1:100,000. 2 colors. Preliminary edition of 1911. Comissão Geographica e Geologica do Estado de S. Paulo. (1) Franca. 20°30'-21°0' S.; 47°40'-47°10' W. Contour interval 25 meters. (2) S. Sebastião do Paraizo. 20°30'-2°0' S.; 47°10'-46°40' W. Interval 25 meters. (3) Mococa. 21°0'-21°30' S.; 47°10'-46°40' W. Interval 25 meters.

[In execution similar to the topographic sheets of the U. S. G. S.: relief in brown contours, drainage in blue, culture in black. The eastern two-thirds of the S. Sebastião do Paraizo sheet and the northeastern corner of the Mococa sheet, which cover parts of the state of Minas Geraes, are blank.]

BRITISH GUIANA. (The Daily Chronicle) Map of British Guiana. [1:1,740,000. 8°55'-0°55' N.; 62°15'56' W. 7 colors. Printed and published by the Estate of C. K. Jardine, Decd., Georgetown, Demarara, 1910. Price 24 cts.]

[Shows political subdivisions, gold and diamond-bearing areas and government experimental fields for rubber and other cultivation.]

AFRICA

AFRICA. (a) Verbreitung und Häufigkeit des Elefanten in Afrika. Von Dr. M. C. Engell. 1:25,000,000. 38° N.-35° S.; 30° W.-70° E. 7 colors.

(b) Verbreitung und Häufigkeit des Löwen in Afrika. Von Dr. M. C. Engell. 1:25,000,000. Same coordinates as map (a). 5 colors.

Taf. 1 and 2, "Verbreitung und Häufigkeit des Elefanten und Löwen in Afrika" by M. C. Engell, *Ergänzungsheft zu Pet. Mitt.* Nr. 171, 1911.

[Admirable maps showing the past and present distribution and the frequency of the elephant and the lion in Africa. Map (a) distinguishes between areas in which the elephant was exterminated (1) during prehistoric times [southern Europe], (2) during antiquity [the Atlas] and (3) during the last centuries [southern Africa], and differentiates the areas of its present existence according to whether it occurs (4) rarely, (5) frequently or (6) generally. The (7) districts in which it is protected by law are also shown.

Similarly the distribution and frequency of the lion is shown on map (b). Separate symbols for regions in which the lion was exterminated (1) in historic time [Asia Minor] and (2) during the last centuries [the greater part of the Atlas, southernmost Africa and the western threshold to the Congo Basin], and for the regions in which it occurs (3) rarely, (4) frequently or (5) generally. The maps show that the whole expanse of the Sahara between the Atlas and the Sudan has never been the habitat either of the lion—contrary to popular belief—or of the elephant. The lion, furthermore, has never occupied the Congo Basin, the coast of Upper Guinea and the hinterland of the Bight of Biafra. He still occurs frequently, however, as near Europe as the Middle Atlas and sporadically in Tunisia.

Both maps are models in their treatment of a zoogeographical topic.]

EGYPT. Die Neue Mariut-Eisenbahn von Alexandrien bis Marsa Matruh. Von Oberingenieur Gustav Kaiser. 1:500,000. 31°30' - 30°45' N.; 26°58' - 29°56' E. 2 colors. With inset: Profil der normalspurigen Strecke von Muassala bis Dhabba (160 km). Horizontal scale 1:300,000; vertical scale 1:3,000. Taf. 25, "Die Mariutbahn," by G. Kaiser, *Pet. Mitt.*, Vol. 58, I, Feb., 1912, pp. 115-116.

[Railroad follows along coast of Mediterranean west of Alexandria. Name derived from the delta lake in the rear of Alexandria, the ancient Mareotis.]

MOROCCO. [Two sheets of the map entitled] Maroc (500,000). Service Géographique de l'Armée [Paris], 1910. Price of each sheet 1 fr. (1) Ffle. No. 6: Marrakech. 1:500,000. 32°23' - 30°8' N.; 11°30' - 7°15' W. Oriented N.2°E. 3 colors. (2) Ffle. No. 9: Oued Noun. 1:500,000. 30°8' - 27°43' N.; 11°20' - 7°13' W. Oriented N.2°E.

[Two of the sheets of the ten-sheet general map of Morocco published by the Service Géographique de l'Armée. Relief in sketch contours in brown, drainage in blue. Index map listed in *Bull.*, Vol. 43, 1911, p. 708, under "Morocco" (first entry).]

SAHARA. Part of the Libyan Desert from the route surveys of W. J. Harding King, 1909 and 1911. 1:2,000,000. 26°15' - 20°30' N.; 26° - 31° E. 2 colors. With inset, 1:20,000,000, showing location of main map. Accompanies "Travels in the Libyan Desert" by W. J. Harding King, *Geogr. Journ.*, Vol. 39, No. 2, 1912, pp. 133-137.

[Valuable map embodying original surveys of a hitherto unknown region of the Libyan Desert lying west-southwest of the oasis of Kharga.]

SOUTHERN RHODESIA. Sketch Map showing the routes of Mr. R. N. Hall in the Mo-Karanga Country, June to Nov. 1908. 1:750,000. 19°25' - 21°20' S.; 30°20' - 32°35' E. 1 color. With inset, 1:22,500,000, showing location of main map. Accompanies "Journeys in the Mo-Karanga (Southern Rhodesia)," by R. N. Hall, *Geogr. Journ.*, Vol. 39, No. 2, 1912, pp. 137-139.

[Route surveys of the ill-known region to the east and to the southwest of Zimbabwe.]

TUNIS. Tunisie Ffle. No. XXV: Souk el Kremis. 1:50,000. 36°49' - 36°36' N.; 8°47' - 9°12' E. Oriented N.4°W. 6 colors. Service Géographique de l'Armée [Paris, 1911]. Price 1 fr. 50.

[A recent sheet of the admirable detailed topographic map of Tunis published by the Service Géographique de l'Armée. Relief in contours with shading; vegetation (four symbols) in green, vineyards in violet, towns and important roads (four symbols) in red, other roads and paths (four symbols) and railroads (two symbols) in black. As is the case with most of the maps published by the Service Géographique the map of the whole country is drawn as a unit; the central meridian, therefore, of each sheet is not oriented N-S. Furthermore, the decimal system of angular measure is employed. For index

map showing the limits of the individual sheets of this map see *Bull.*, Vol. 43, 1911, p. 547, under "Algeria-Tunis."]

ASIA

CHINA. Compass Route Traverse between Hsi-ning Fu and Kan-chou Fu, by O. R. Coales, August and September, 1910. 1:1,000,000. 39°0' - 36°30' N.; 100°30' - 102°30' E. With inset, 1:32,000,000, showing location of main map. Accompanies note, "The Road from Hsining-fu (Sining) to Kanchou-fu," *Geogr. Journ.*, Vol. 39, No. 2, 1912, pp. 135-156.

[Valuable route survey of region lying to the northeast of the Koko Nor. The route involved crossing the Nan Shan and the Richthofen Mts.]

INDIA. Railway and Canal Map of India. 1910. Scale, 1 Inch=32 Miles, or 1:2,027,520. 40° - 5° N.; 58° - 102° E. 6 sheets. Survey of India. Price 8 rupees. Two editions: (1) "without hills." 8 colors. (2) "with hills." 9 colors.

[This and another map of India on the same scale are the largest scale general maps of India published by the Survey. Its main value lies in its large scale. In its representation of railroads and canals, which is revised annually, it is authoritative; in the present edition they have been corrected to March 31, 1910. Distinction is made between existing railroads and canals and those sanctioned and under construction; separate symbols are used for standard, medium and narrow gage railroads and for canals intended for navigation or irrigation or for both simultaneously. The remainder of the material of the map is brought down to 1904. The fact that the map is printed from old plates accounts for the unsatisfactory representation of relief on the edition "with hills." Drainage is in blue; political boundaries are indicated by color.]

INDIA-CHINA-AFGHANISTAN. [Five sheets of the map of] India and Adjacent Countries. 1:1,000,000. Survey of India. Price of each sheet 1 rupee. (1) Sheet No. 38. Punjab, North West Frontier Province, Baluchistan and Afghanistan. 36° - 32° N.; 68° - 72° E. 5 colors. Provisional Edition, 1910. (2) Sheet No. 44. Punjab and Rājputāna. 32° - 28° N.; 72° - 76° E. 6 colors. Provisional Issue, 1910. (3) Sheet No. 47. Bombay and Hyderabad. 20° - 16° N.; 72° - 76° E. 5 colors. Provisional Issue, 1910. (4) Sheet 100. Parts of Tibet and China (Yün-nan and Ssu-ch'uan Provinces). 1 color. Provisional Issue, 1911. (5) Sheet 101. Part of China (Yün-nan, Ssu-ch'uan, and Kuei-chou Provinces). 2 colors. Provisional Issue, 1910.

[These sheets belong to a valuable new map of Asia south of 40° N. and included between 44° and 124° E. that is being published by the Survey of India. It is the intention to publish a preliminary edition of each sheet prior to its publication in final form. Thus, the five sheets listed above represent various stages of completeness. Sheet 100 contains drainage, roads and places only, while Sheet 101 also shows relief. The other three sheets are practically complete: Sheets 44 and 47 show relief in shading, reproduced by half-tone process, drainage in blue, roads in red. Sheet 38 shows relief in brown hachuring, roads and drainage in black. These three sheets all show political boundaries in colors. Cf. index map in the "Catalogue of Maps Published by the Survey of India," Calcutta, 1910.]

AUSTRALASIA AND OCEANIA

AUSTRALIA. Verbreitung der Speerschleuder in Australien. Entworfen von Dr. F. Graebner. 1:10,000,000. 2 colors. Taf. 22, "Australische Speerschleudern" (first part), by F. Graebner, *Pet. Mitt.*, Vol. 58, I, Feb., 1912, pp. 82-85.

[No less than 24 symbols to distinguish various types of spears.]

EUROPE

AUSTRIA-HUNGARY. Übersicht der Arbeiten an der Spezialkarte 1:75,000. [1:5,700,000.] 51°15' - 42°0' N.; 9°20' - 26°50' E. 1 color. Taf. 33, *Pet. Mitt.*, Vol. 58, I, March, 1912.

[Copy of the official index map of this standard topographic map of Austria-Hungary which is being published in a revised second edition since 1889 by the

Military Geographical Institute of Vienna. For description see *Mitt. des k. u. k. Militärgeogr. Inst.*, Vol. 27:1907, Vienna, 1908, pp. 111-115.]

AUSTRIA-HUNGARY, ETC. Übersicht der Arbeiten an der Generalkarte 1:200,000. [1:10,000,000.] $53\frac{1}{2}^{\circ}$ - $38\frac{1}{2}^{\circ}$ N.; $6^{\circ}50'$ - $30^{\circ}50'$ E. 1 color. Taf. 34. *Pet. Mitt.*, Vol. 58, I, March, 1912.

[Copy of the official index map showing sheets published to March 1912 of the general map of Austria-Hungary and adjoining regions, sheets of which were listed in the *Bull.*, Vol. 43, 1911, p. 552. For description see *Mitt. des k. u. k. Militärgeogr. Inst.*, Vol. 27:1907, Vienna, 1908, pp. 115-117.]

CENTRAL EUROPE. (a) Blatteinteilung der Übersichtskarte von Mitteleuropa 1:300,000 herausgegeben von der Kartographischen Abteilung der Königl. Preuss. Landesaufnahme. [1:6,000,000.] 60° - 46° N.; $12\frac{1}{2}^{\circ}$ - $34\frac{1}{3}^{\circ}$ E.

(b) Uebersichtsblatt zur topographischen Specialkarte von Mittel-Europa im Massstabe 1:200,000. [1:5,000,000.] $58\frac{1}{3}^{\circ}$ - $44\frac{1}{3}^{\circ}$ N.; $2\frac{2}{3}^{\circ}$ W.- 29° E. Taf. 20 and Taf. 24. *Pet. Mitt.*, Vol. 58, I, Feb., 1912.

[Map (a) a copy of the official index map of a map of central Europe in five or six colors in course of publication by the Prussian Topographical Survey similar in scope to that published by the Austrian Military Geographical Institute (cf. *Bull.*, Vol. 43, 1911, p. 552, and "Austria-Hungary, etc.," above). Map (b) index map of an older general map of central Europe (the so-called Reyman'sche Karte), which is being superseded by map (a).]

CENTRAL EUROPE. Übersicht der Arbeiten an der neuen Übersichtskarte von Europa 1:750,000. [1:11,700,000.] $55\frac{1}{2}^{\circ}$ - $40\frac{1}{2}^{\circ}$ N.; $3^{\circ}50'$ - $35^{\circ}50'$ E. 1 color. Taf. 32. *Pet. Mitt.*, Vol. 58, I, March, 1912.

[Copy of the official index map showing the sheets published to March 1912 of a general map of central Europe in 40 sheets, being published by the Military Geographical Institute of Vienna. This map is published in two editions: one with altitude tints and the other with relief in shading. For a description see *Mitt. des k. u. k. Militärgeogr. Inst.*, Vol. 27:1907, Vienna, 1908, pp. 121-122.]

DENMARK. Die Faeröer. Nach den Vermessungen des dänischen Generalstabes 1895-99. [1:600,000.] $62^{\circ}25'$ - $61^{\circ}20'$ N.; $7^{\circ}40'$ - $6^{\circ}15'$ W. Taf. 11, "Land und Leute der Faeröer," by C. Küchler, *Geogr. Zeitschr.*, Vol. 17, No. 11, 1911, pp. 601-618.

[Reproduced from *Atlanten*, Vol. 2, Copenhagen, 1905.]

GERMANY. (a) Übersichts-Blatt zu der Karte des Deutschen Reiches im Massstabe 1:100,000. Bearbeitet von der Kartogr. Abt. der Kgl. Preuss. Landesaufnahme, dem Topogr. Bureau des Kgl. Bayerischen und der Abt. für Landesaufnahme des Kgl. Sächs. Generalstabes, sowie dem Topogr. Bureau des Kgl. Württemb. Kriegsministeriums. [1:2,500,000.] $56\frac{1}{2}^{\circ}$ - 47° N.; $4\frac{1}{3}^{\circ}$ - $23\frac{1}{3}^{\circ}$ E.

(b) Übersichtsblatt zur Topographischen Übersichtskarte des Deutschen Reiches in 1:200,000. Herausgegeben von der Kartographischen Abteilung der Königl. Preuss. Landesaufnahme. 1:3,500,000. 56° - 47° N.; $5\frac{1}{3}^{\circ}$ - $23\frac{1}{3}^{\circ}$ E. Taf. 23 and Taf. 21, respectively, *Pet. Mitt.*, Vol. 57, I, Feb., 1912.

[Map (a) a copy of the official index map of the standard topographic map of the German Empire in 674 sheets. There are three editions: two in black, one engraved on copper and the other a lithographic transfer therefrom; the third in three colors. Of this last edition about 200 sheets have been published, of the other two, all sheets. Map (b) the official index map of a map of Germany in colors based on the above standard map in 1:100,000. In Oct. 1911 166 sheets out of a total of 196 sheets had been published.]

GERMANY. [Fourteen sketch maps entitled:] Mittlere Jahres- und Monats-temperaturen der Schwäbisch-Bayerischen Hochebene nach der Formel $\frac{1}{4}(7h+2h+2 \times 9h)$ [observations at 7 A. M., 2 P. M. and 9 P. M.]. [1:6,400,000.] [49° - $47\frac{1}{2}^{\circ}$ N.; 8° - 14° E.] 1 color. (1) Jahresmittel auf das Meeresniveau red[uziert] (1851-80). (2) Jahresmittel nicht red[uziert] (1851-80). (3-14) Monatsmittel 1851-80. Taf. 2, "Die Temperaturverhältnisse der schwäbisch-bayerischen Hochebene und des Alpenvorlandes" (first part), by A. Knörzer, *Geogr. Zeitschr.*, Vol. 17, No. 3, 1911, pp. 122-134.

GERMANY. Karte des Pfälzerwaldes. 1:600,000. [$40^{\circ}39'$ - $48^{\circ}42'$ N.; $7^{\circ}10'$ - $8^{\circ}15'$ E.] Taf. 9, "Der Pfälzerwald," by D. Häberle, *Geogr. Zeitschr.*, Vol. 17, No. 6, 1911, pp. 297-310.

[Shows limits of the continuous buntsandstein area, the southern (political)

boundary of the Palatinate and the southern boundary of the Pfälzerwald. By the latter term it is proposed to designate that portion of the Hardt Mts. which bears the Palatinate Forest.]

GERMANY-AUSTRIA. Karte des Inn- und Salzachgletschers. 1:700,000. [48°20' - 47°40' N.; 11°45' - 13°15' E.] Accompanies, on p. 457, "A. Penck und E. Brückner—Die Alpen im Eiszeitalter" (review) by K. Keilhack, *Geogr. Zeitschr.*, Vol. 17, No. 8, 1911, pp. 451-462.

[Reproduced from the above work.]

ITALY. [Six geological sketch maps of the vicinity of Naples]: (1) Formenskizze der Roccamonfina. 1:100,000. [41°20' N. and 14°0' E.]. (2) Schematische Skizze zur Tektonik des Gebirgsrandes bei Nocera. 1:100,000. [40°45' N. and 14°40' E.]. (3) — des Gebirgsrandes bei Cancellò. 1:25,000. [41°0' N. and 14°25' E.]. (4) — des Gebirgsrandes östlich Nola. 1:25,000. [40°55' N. and 14°35' E.]. (5) — des Beckens von Neapel. 1:500,000. [41°20' - 40°30' N.; 13°50' - 14°45' E.]. (6) — des Gebirgsrandes bei Maddaloni. 1:25,000. [41°3' N. and 14°25' E.]. Abbildungen 11, 14, 16, 15, 18, and 17, respectively, on Taf. 26 and 27, "Vulkanismus und Tektonik im Becken von Neapel" (first part) by W. Kranz, *Pet. Mitt.*, Vol. 58, I, March, 1912, pp. 131-135.

NORWAY. [Three sheets of the] Topografisk Kart over Kongeriket Norge. 1:100,000. Norges Geografiske Opmaaling [Christiania]. Price of each sheet kr. 0.60. (1) [Sheet] 20 A: Nannestad. 60°18.0' - 59°59.5' N.; 10°47' - 11°36' E. 3 colors. Edition of 1882, revised 1906. (2) 31 C: Nordre Fron. 61°48' - 61°29' N.; 9°1' - 9°53' E. 3 colors. Edit. of 1910. (3) L 11: Nordfold. 68°0' - 67°40' N.; 6°13' - 5°13' E. 4 colors. Edit. of 1911.

[Three sheets of the standard topographic map of Norway. Sheets 20 A and 31 C belong to the southern half of this map (south of 65° N.), the limits of whose sheets do not coincide with geographical co-ordinates, while sheet L 11 belongs to the northern half of this map which is subdivided into sheets by meridians and parallels. Cf. the index maps in *Geogr. Jahrbuch*, Vol. 32, 1909. Relief is mainly expressed by contours and shading in gray-green (on sheet 20 A below 200 meters by black hachuring); drainage is in blue. Sheet L 11 is an admirable representation of a glaciated district. On it glaciers are specially differentiated in green.]

TURKEY. Die Befestigung des westlichen Dardanellen-Eingangs. Nach Angaben von Generalmajor z. D. A. Janke. 1:100,000. 40°14' - 39°58' N.; 26°10' - 26°28' E. 5 colors. Taf. 35, "Die Dardanellen," by A. Janke, *Pet. Mitt.*, Vol. 58, I, March, 1912, pp. 179-181.

POLAR

SPITZBERGEN. Ice Conditions in the Spitsbergen Seas, 1911. 1:3,000,000. 79° - 74° N.; 7° - 23° E. Accompanies on p. 160 note with same title, *Geogr. Journ.*, Vol. 39, No. 2, 1912, p. 162.

[Communicated by Gunnar Isachsen, based on observations made by Capt. H. Naess of the Arctic Coal Co. Distinguishes between ice fastened to the land, unbroken and light drift ice, and scattered ice, and shows changes in edge of ice between May 23 and June 21, 1911.]

HISTORICAL

FARTHER INDIA AND MALAY ARCHIPELAGO. (a) Karte des Südöstlichen Asiens nach Ptolemäus. 1:30,000,000 approx. 32° N. - 10° S.; 80° - 115° E. approx.

(b) Kartenbild des Ptolemäus mit den heutigen Namen. 1:40,000,000. Same co-ordinates as map (a).

(c) Südost Asien. 1:40,000,000. 35° N. - 10° S.; 85° - 121° E.

Accompany, as Taf. 1, "Südost-Asien bei Ptolemäus," by W. Volz, *Geogr. Zeitsch.*, Vol. 17, No. 1, 1911, pp. 31-44.

[Map (a) Ptolemy's map with the nomenclature of the *Geographike Hyphegesis*; map (b) the same map on a smaller scale with present nomenclature where features possible of identification; map (c) a modern map showing the features under consideration.]